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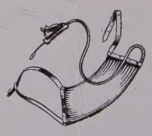

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This Month's Cover

Efficient bulk handling has had an important influence on greater use of agricultural lime on farms in many parts of New Zealand, but farmers and contractors are still seeking to improve present methods. This month's cover, which has been reproduced from an Ektachrome (Kodak (N.Z.) Ltd.) photograph, shows loading of bulk lime with a field loader on the property of Mr. D. Thomas, Glasnevin, North Canterbury. The type of elevator shown, which was described in an article which appeared on page 105 of the August 1952 issue of the "Journal", was designed to handle lime from farm stockpiles to the distributor.

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Aerial Topdressing and Distribution of Weedkillers

By P. B. LYNCH, Crop Experimentalist, Department of Agriculture, Wellington, and L. J. MATTHEWS, Weeds Research Officer, Department of Agriculture, Wellington

THE coming of aerial topdressing to New Zealand could scarcely have been more appropriately timed. An increasing demand for primary production has coincided with a period of labour shortage. Labour for hand topdressing has been practically unobtainable. The aircraft industry has risen to the occasion and has done much to increase the output of livestock products from the hills.

THE quantities of fertiliser dropped from the air and the areas topdressed continue to expand at a remarkable rate. This is shown by the following table which has been compiled from figures supplied by the Aviation Industry Association of New Zealand (Inc.):—

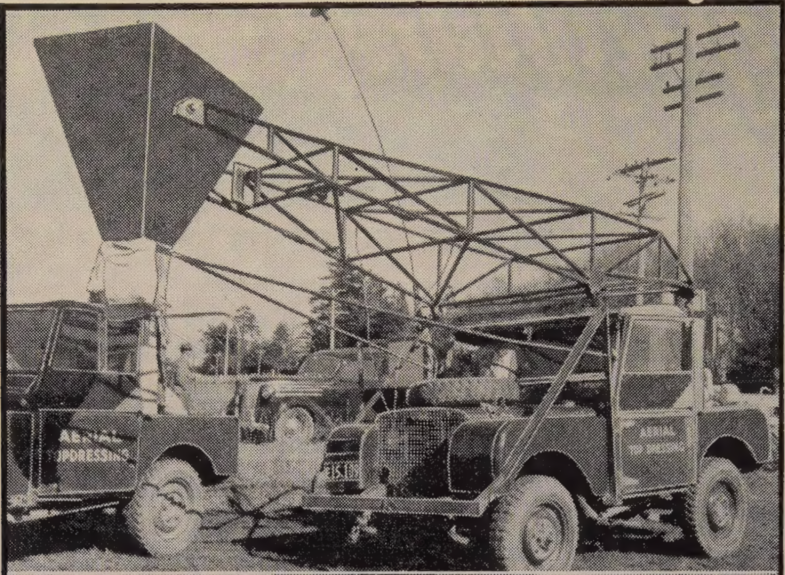
Aerial Fertilising

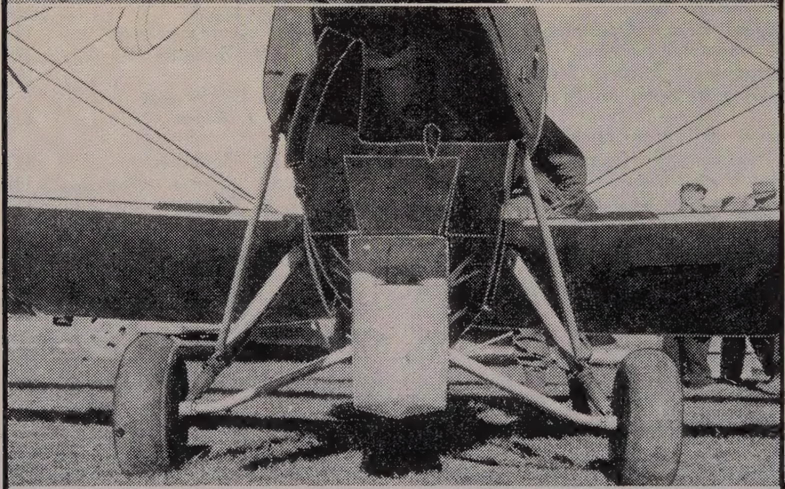
Year ended 31 March	Weight distributed (tons)	Acres treated	Number of operators
1950	5,000	48,740	7
1951	44,820	428,740	22
1952	88,870	829,580	28

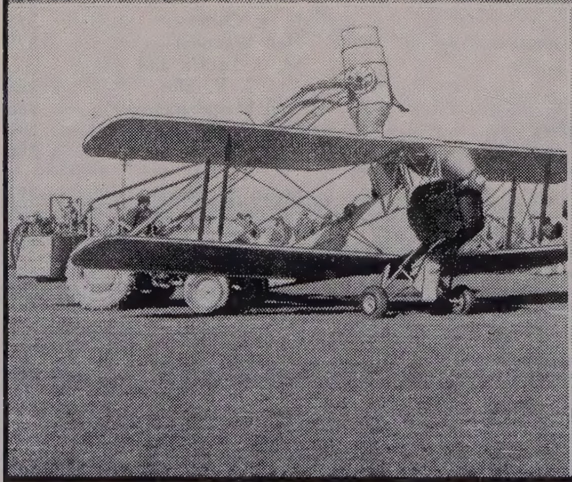
Seed Sowing

Year ended 31 March	Weight distributed (lb.)	Acres treated
1950	154,050	25,670
1951	107,180	18,760
1952	206,020	30,110

The future of aerial topdressing is likely to be one of continuing expan-

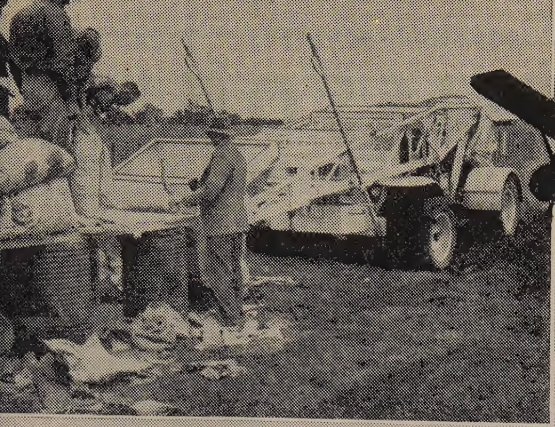


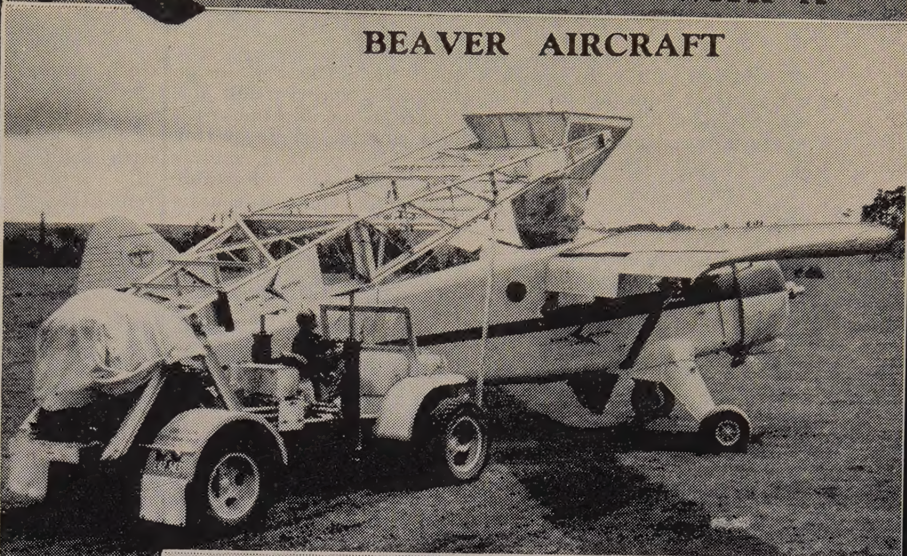


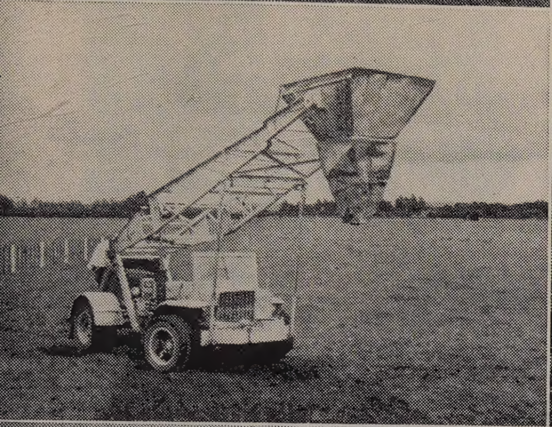


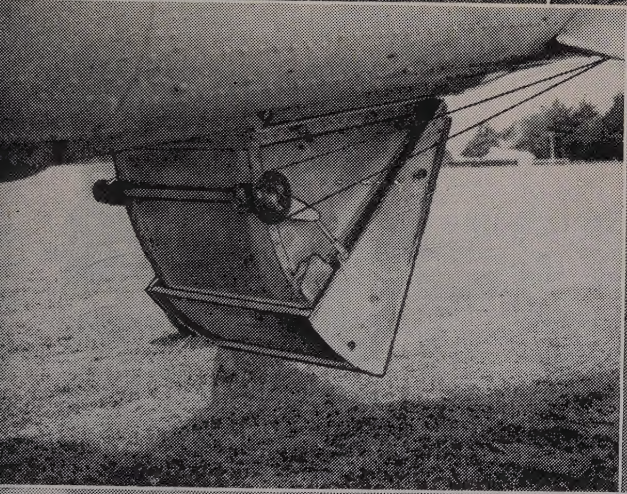
Most of the work of aerial topdressing and sowing is still being done in New Zealand by Tiger Moth aircraft, with which the service was pioneered after the Second World War. Operations with this type of aircraft are shown in the illustrations on the left and below. Upper left—A loader, by which the aircraft hopper is filled. Middle left—The discharge chute on a Tiger Moth. Lower left—Loading the aircraft with fertiliser. Below—Dropping fertiliser from the air.

AERIAL TOPDRESSING WITH A BEAVER AIRCRAFT









The recent introduction of the Canadian-built de Havilland Beaver aeroplane for aerial topdressing in New Zealand is the first step toward the replacement of the Tiger Moth with heavier commercial aircraft. The Beaver, which carries a larger load and has a longer effective operating range, is used extensively overseas for supply dropping, crop dusting and spraying, and similar purposes and has proved entirely suitable for aerial topdressing in New Zealand. Upper left—Filling the hopper of a fertiliser loader with fertiliser and seed preparatory to loading a Beaver. Middle left—The loader, with hopper in the raised position, ready to move to the aircraft to load it. Upper right—The fertiliser and seed being transferred to the Beaver. Left—The discharge chute underneath the fuselage of the Beaver, showing the shutter in the closed position. Lower left—An aircraft taking off from a flight strip in hilly country. Lower right—Topdressing hill country.

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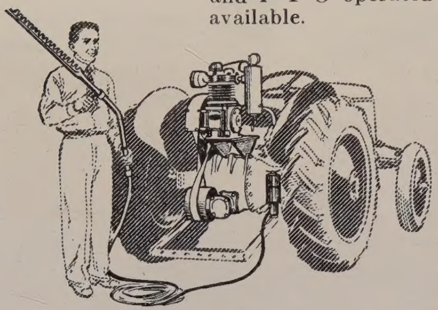

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[*National Publicity Studios photo.*

A dust cloud that has resulted from the aerial application of ordinary superphosphate. If fertiliser is released in windy weather more than a few feet above the ground, much of this dust is blown well away from the field being topdressed.

sion. Although it is hardly possible that the rate of growth shown in the past 3 years can be maintained, there is no doubt that aerial topdressing has become a permanent and important feature of farming. An annual distribution of nearly 90,000 tons of fertiliser represents about 11 per cent. of the total production of phosphatic fertiliser in this country.

Makes of Aircraft

Aircraft operators are becoming increasingly concerned about the future supply of Tiger Moth aircraft. At present 118 Tiger Moths are in use in aerial topdressing. They are almost the only type in operation. This versatile aircraft has done a wonderful job, but it is not by any means ideal for the purpose. One of the aeroplanes that has been tried is the Canadian Beaver and five of these are in operation. The Beaver carries about 15cwt. of fertiliser and has a longer effective operating range. However, it is much more expensive, and maintenance costs have proved considerable. There is no doubt that an aircraft designed for aerial topdressing in New Zealand conditions would be of tremendous assistance to the industry. A special committee has been set up to study this matter.

Types of Fertiliser

The production of special types of fertiliser for aerial topdressing has not yet been undertaken commercially in this country. Distribution experiments indicate that a fine, granular product would be most suitable and trials are continuing in an endeavour to define the most desirable granule sizes more precisely. The size of the aerial topdressing industry surely warrants the production of a fertiliser best suited to its purpose.

Concentrated fertilisers such as double superphosphate appear to have a special value for aerial distribution. If twice the area can be treated with the same payload as that used with ordinary superphosphate, distribution costs must be reduced. The efficiency of the distribution of the low rates of concentrated fertilisers applied will be measured in distribution trials.

AERIAL DISTRIBUTION OF WEEDKILLERS

In initial trials of aerial distribution of weedkillers 1 per cent. or 5 per cent. hormone dusts were used. The dusts were airborne, little reached the ground, and poor control resulted. The hormone dusts were next mechanically mixed with superphosphate compounds. The hormone dust proved to be much lighter than the superphosphate particles and separated before reaching the ground. The next development involved the mixing of the hormone dust chemically in the manufacturing of superphosphate. Extensive ground trials were conducted with this mixture to determine its weedkilling properties. The ground trials proved that there was up to 30 per cent. reduction in toxicity of the hormone content due to the mixing process used.

The use of granulated fertilisers enables topdressing loads from aircraft to be dropped with precision and operations to be carried out at much greater heights and in wind speeds much faster than are possible when dusty materials are used.

Precautions with Aircraft

BECAUSE of the wide use of aircraft for topdressing farmland in New Zealand farmers are urged to exercise care during aerial topdressing operations to avoid accidents.

Do not walk or stand close to a revolving propeller.

Do not touch the propeller at any time.

Do not touch the aircraft at all unless instructed to do so by the pilot.

Be sure that no stock or dogs wander on to the runways during operations.

Keep children away and do not stand on the wings or fuselage except in the places provided.

Co-operation with pilots and staff to the utmost is necessary for the safe conduct of aerial topdressing operations.

—*C. M. B. OLIVECRONA, Machinery Instructor,*
Department of Agriculture, Wellington

In a more recent product the hormone is added to the superphosphate in the physical phase of manufacturing. Ground trials have shown that there is no reduction in the toxicity of the hormone content and the hormone does not separate from the superphosphate before reaching the ground as it does in the mechanically mixed preparations. This product fulfills the requirements for aerial application. Spraying trials have also been conducted. A concentrated hormone is applied in 2 to 6 gallons of diesel oil per acre. Water is not satisfactory as a carrier.

Time of Application

The hormonised superphosphate compound should normally be applied when wind speeds are less than 10 miles per hour. For aerial spraying and dusting the optimum conditions are those of early morning, when the air convection currents are downward. Applications made under these conditions minimise drift and present less danger to neighbouring crops of value.

Types of Weeds

The hormonised superphosphate compound and the concentrated hormone, both based on 2,4-D acid, are successful for the control of susceptible annual and biennial weeds, such as thistles. More favourable results have been achieved with the hormonised superphosphate compound on herbaceous, lateral-rooted perennials, such as ragwort and Californian thistle, than with the concentrated hormone solution applied in diesel oil. No satisfactory control measures have been determined for the eradication of woody perennials, such as gorse from the air. The spray particles settle as a mist on the top foliage, there being insufficient penetration of the spray into the centre of the bushes for eradication.

Weedkillers sprayed from the air settle as a mist on the top foliage of woody perennials and there is insufficient penetration into the centre of the bush to ensure eradication.

◆

Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given as follows from Station 1YA Auckland at 7.15 p.m.:—

6 May—"Grass-grub Control", by J. F. Till, Instructor in Agriculture, Department of Agriculture, Auckland, and J. M. Kelsey, Department of Scientific and Industrial Research, Ashburton.

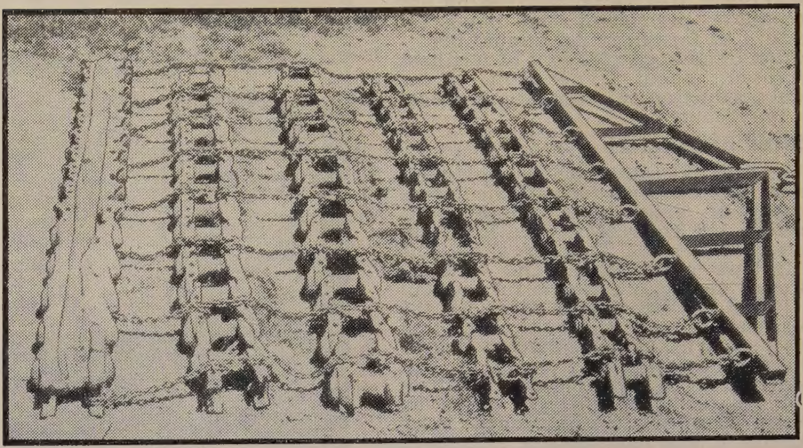
16 May—"Meet the Commercial Beekeeper", an interview, by D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, and H. C. Belin, commercial beekeeper.

20 May—"Tractor Safety", by D. F. Scott, Machinery Instructor, Department of Agriculture, Auckland.

27 May—Y.F.C. session, by Auckland Central district committee.

◆

Improved Clodcrusher and Leveller



THERE are numerous variations in design of the farm implement commonly known as the clodcrusher or leveller. Many of these aids to soil cultivation, which are often novel in design and ingenious in the use of discarded materials and equipment, are constructed by farmers to suit the particular needs of the land under development.

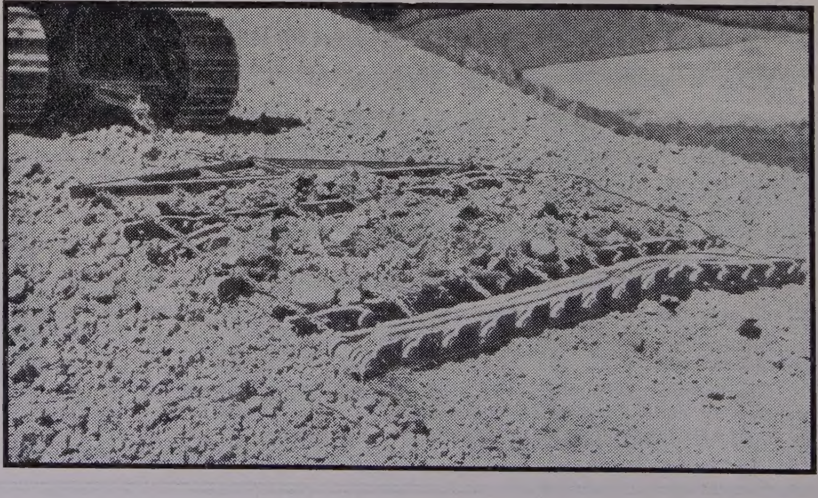
IN the Wakefield district, Nelson, considerable areas of hill country which is low in fertility though ploughable and is known locally as the Moutere Hill clays are being brought in from gorse, manuka, and other rubbish by heavy swamp ploughs turning a furrow 12in. or more deep. Normally a season's fallow is necessary to achieve adequate consolidation, and the rather intractable subsoil exposed by deep ploughing is prepared for a clearing crop by discs and harrows before being sown down finally to grass. Experience has shown that a heavy clodcrusher drawn across the furrows not only evens up natural depressions and mounds far better than any other farm implement, but also greatly facilitates conditioning of the soil for the first crop.

A locally designed clodcrusher that has proved highly satisfactory consists of up to 5 old track chains from tracklaying tractors linked together as shown in the illustration above. This implement weighs a ton or more, but can be operated quite readily by the class of tracklaying tractor (35 h.p. or over) normally used for hill-country development work. Being heavy and flexible, it collects considerable quantities of earth from any high spots and deposits its spoil in the depressions to give a much more level surface than would be achieved with other cultivating implements.

This type of clodcrusher can be recommended to anyone doing similar land development work. The old tractor tracks can be obtained as discards from firms servicing agricultural machinery or with interests in tracklaying tractor equipment. Normally these discards are dumped, but in Nelson they have acquired some small commercial value because of their use as described above.

—*D. M. E. MERRY,*
Instructor in Agriculture,
Department of Agriculture,
Nelson

BELOW: A clodcrusher of the type described in this article, which has the double advantage of evening up natural depressions and mounds and also aiding in the conditioning of the soil for the first crop.



Double-brood Method of Uniting Beehives

By J. E. RODIE, Apiary Instructor, Department of Agriculture, Hawera

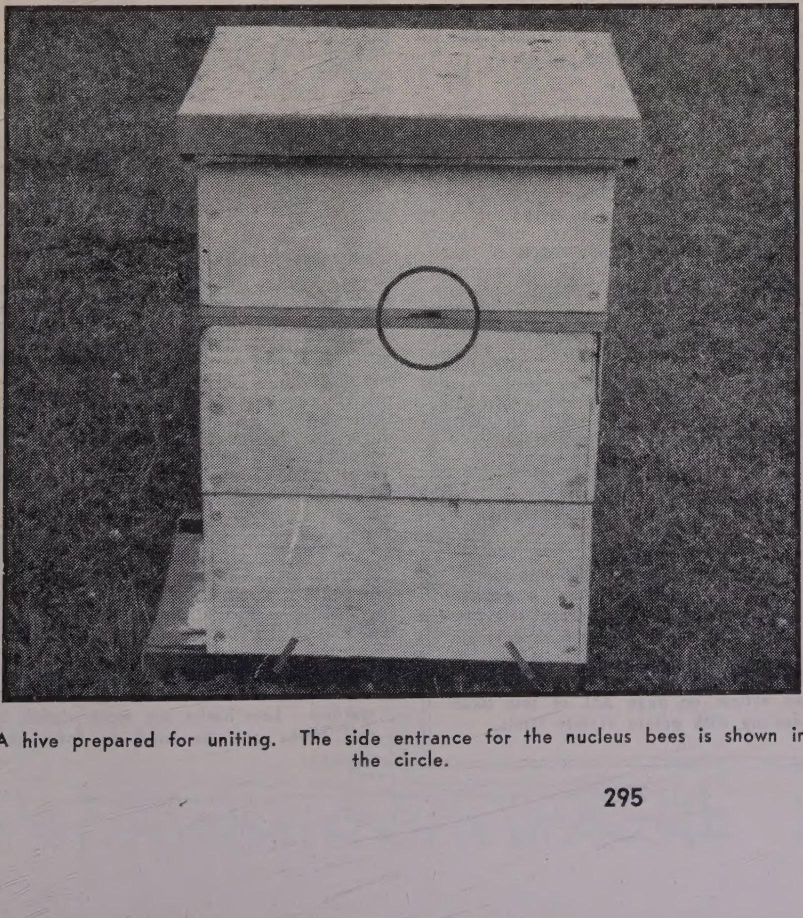
THE double-brood system is an efficient method of boosting hive strength at the beginning of the honey flow. It has been carried out with success for many years in Taranaki, and beekeepers who have had trouble maintaining hive strength will find it helpful.

THE nucleus is usually prepared from the parent hive in October, being made up of four frames of brood and bees (without the queen) and an appropriate amount of honey and pollen. The nucleus is placed in a full-width super on a division board, and the remaining space is filled with empty combs. As there must be sufficient bees to cover all the brood, a shake of bees from an extra comb is desirable. A mated queen or a queen cell can be introduced to the nucleus, but the decision on this point must be left to the discretion of the beekeeper, who should know which method will suit his district. It is advisable to introduce the new queen immediately and to block the entrance of the nucleus with loosely packed grass. A hive mat is used to cover all frames to retain warmth.

When this work has been done the lid of the hive which is going to accommodate the nucleus should be removed and all burr comb should be taken from the tops of the frames. The division board holding the nucleus should be fitted flush on top of the hive with the entrance facing the most favourable direction away from the entrance to the hive below. The nucleus and division board must be removed periodically for inspection and feeding purposes, so the division board should be attached to the nucleus super. Crate staples are best for this job, but they should be driven only a little more than half-way into the timber so that the division board can be readily removed later when the two colonies are to be united. The usual hive manipulations, such as feeding, inspection, and where necessary the placing of additional supers of combs on the parent hive and nucleus before the main honey flow, may be carried out.

Construction of Division Board

The division board should be of hardboard or other suitable material. Hardboard is slightly absorbent and will take up some warmth from the hive below. Strips of timber ½in. x ¼in. deep are placed around the side of the division board, leaving a ½in. gap for the entrance. This piece of ½in. timber cut out may be left on the board with a nail through one end, thus allowing the entrance to be opened or closed. In cold districts a strip of gauze fitted down the centre of the board is an advantage, as it allows more warmth into the nucleus.



A hive prepared for uniting. The side entrance for the nucleus bees is shown in the circle.

Time for Uniting

The success of the operation from this stage on depends on the judgment of the beekeeper. It is imperative that the uniting be carried out just before or at the beginning of the main honey flow, and the whole procedure must be well timed. The nucleus should be up to full strength; otherwise no advantage will be gained. When the colonies have been united the queen will move down into the brood nest of the parent hive and all the brood will be covered by the bees.

Uniting should not be carried out during high winds, which may cause a heavy loss of field bees as well as a large amount of brood because of an insufficient number of bees to keep the brood warm. All of this will retard the potential of the double-brood system and nothing will be gained. If an unforeseen break in the weather occurs after uniting, it may be necessary to place the brood from the top chamber down next to the brood in the bottom chamber, thus ensuring that all the young brood is well covered by the bees. This manipulation is not usually necessary if the weather remains fine, although in some districts it may be found necessary regardless of the weather.

Uniting Nucleus and Parent Hive

There are two methods of uniting the nucleus and parent hive which can be adapted to suit beekeepers. If the queen in the bottom hive needs to be replaced, the two hives can be united by the paper method. Usually the queen in the top hive will remain alive, but the queen in the bottom hive will be done away with by the queen from above. Thus the newly united hive has a young queen. The main disadvantage in using this method is that the surviving queen may be injured in the battle for supremacy of the hive.

The other method recommended is to find and remove the old queen in the bottom hive and then unite. As soon as the bees have united the queen will move down. There is usually no need to place the brood in the upper chamber down into the body of the hive, provided the main honey flow is beginning, for as soon as the brood hatches the space is immediately filled with honey. It is advisable to place an extra super of combs on the hive, as the honey flow will be in full swing.

The double-brood system does not in any way interfere with the wintering of the bees, and this operation can be carried out as usual.

The double-brood method is in use in many parts of New Zealand and also in America. Because of different conditions in districts modifications are made on the system to suit local conditions. In the first year only a percentage of the hives should be adapted. If they are united successfully, the remainder should then be brought in. This will also give the opportunity of noting results, and the method can then be used with confidence.

HEADING PHOTOGRAPH: Many herbs can be grown to advantage in a rock garden. Low herbs are most useful, but tall herbs can be used to form backgrounds.

Herbs in the Home Garden

A WELL laid out garden is usually characterised by an atmosphere of peace and to most garden lovers that is one of its greatest attractions, but no garden or part of a garden symbolises more that atmosphere than does a well laid out herb garden. To many not least of its charms is the association of ideas it conjures up, for no class of plants has played a greater part in the story of mankind, whether in folklore, history, romance, or science, than the group of plants called herbs. In the herb garden more than in any other kind of garden each plant has a special significance. The section of this article on herbs is by A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin; the section on work in the home garden for April is by C. L. Napier, Horticultural Instructor, Department of Agriculture, Hastings.

IT is difficult to define a herb satisfactorily. The usual definition of a herbaceous plant is not satisfactory, for though plants used herbally may be herbaceous plants, often they are not. Trees or shrubs, deciduous plants or evergreens, large plants or small, primitive plants or aquatics, all may be called herbs if used herbally, but the range of plants in most herb gardens is usually limited to rather small woody or typically herbaceous plants grown for culinary or medicinal use or for their aesthetic value.

The herb garden offers greater scope for ingenuity and wider possibilities of variation in design or layout than even the rock garden. It lends itself to a wide variety of designs ranging from complete informality to a degree of formality that, by modern standards, would, if applied to many of the other branches of decorative gardening, be considered too artificial to be in good taste.

Design and Layout

Herb gardens may be small or large; the herbs may be planted on banks or in beds, low hedges may be formed of them, they may be planted among rocks as are rock plants, or they may be grown with other plants in mixed borders. Design may incorporate both formal and informal features, provided the plants are chosen and set out with discrimination.

If a formal garden is favoured, the simplest designs are often the most satisfactory. A popular but very simple design, yet one which if tastefully planted is difficult to improve, consists of a circular central bed containing a pool or garden ornament such as a sundial, bird-bath, or bird-lodge surrounded by a path which cuts into the corners of four otherwise square or rectangular beds each separated by paths and lying equidistant around the central path, the whole surrounded by a neat-edged path.

An even simpler yet attractive herb garden can be made by interplanting and edging with herbs a path, preferably a stone-flagged one, which may lead from one section of the garden to another or from the kitchen or side door to the vegetable garden.

Herbs can be planted in groups in ordinary herbaceous borders or in sections each devoted to herbal plants used for a specific purpose. For example, a garden or section may be planted in herbs which attract bees, another in herbs which are attractively scented, others in medicinal herbs or herbs used in cooking, for flavouring in salads, for dyes, or for their attractive or unusual flowers or foliage. A well-designed formal garden probably provides the most attractive setting for herbs and affords great scope for artistic setting out and the utilisation of a great variety of herbs.

Common Herbs

The highly seasoned dishes common in some overseas countries are not much favoured in New Zealand, and consequently the range of herbs in New Zealand home gardens is usually restricted to such plants as chives, mint, parsley, sage, and thyme, plants that should be in all good-sized home gardens, for good cooks almost invariably find regular need for them. Their culture is simple and they grow well without special treatment in most garden soils.

Chives have tops like spring onions and are propagated by division. Clumps can be replanted each year from late autumn until early spring any time conditions are favourable. They should be set out about 12in.

Choice of Potato Varieties

Choice of good varieties and of varieties suitable for early, mid-season, and late planting can have a marked effect on crop yields. Correct selection is particularly important with a staple crop like potatoes and the attention of home gardeners is therefore drawn to an article on page 321 of this issue dealing with potato variety trials.

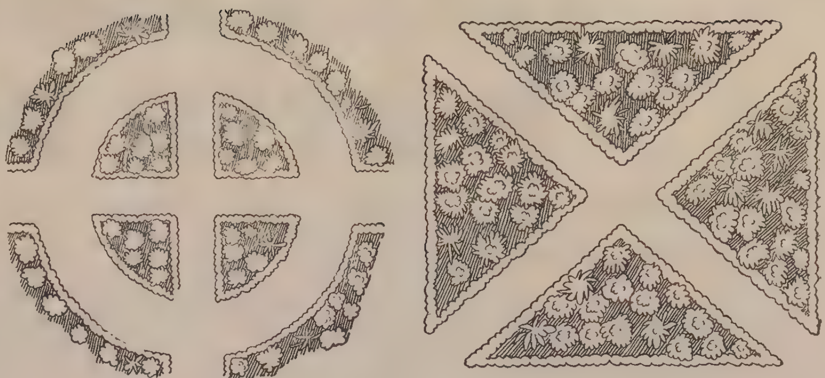
apart and clumps cut regularly in succession to ensure a continuous supply of young leaves. The leaves of chives are used similarly to spring onions, though they are milder than most varieties of spring onions. They are useful chopped for sandwiches and salads or mixed in scrambled eggs. Usually they are grown in clumps, but the clumps may be broken up and individual "bulbs" set out about 2in. apart and grown on to be used like spring onions.

Mint is usually propagated by rooted cuttings of the creeping or underground stems. In gardens inclined to be dry it should be planted under or near a water tap. Its tendency to spread where conditions suit it can be overcome by surrounding it with a sheet of tin about 8in. deep.

Parsley is usually best sown twice a year (in spring and autumn). Seedlings should be thinned early and spaced 10 to 12in. apart. Liberal spacing is desirable, as plants then have less tendency to run to seed prematurely.

Sage is usually grown as a perennial and is propagated by cuttings taken from a good stock plant. There are two kinds of common sage. The broad-leafed kind, which flowers little or not at all, is usually preferred, though the narrow-leafed kind is also valuable. Sage grows up to 14 to 16in. tall and should be set out about 18in. apart in a warm situation. It is probably the most commonly used of all herbs for seasoning.

Thyme is of two principal kinds, common and lemon. Both are perennials and may be propagated by seed, the breaking up of clumps, or by cuttings; plants should be set out about 12in. apart on a reasonably dry, well-drained border. Good drainage is important, as thyme is readily injured by wet soil conditions. Other interesting kinds of thyme are the silver, orange, and golden varieties. In addition there are several varieties of wild thyme.



Designs for herb gardens; beds and borders with gravel paths.

Thyme is one of the most useful garden herbs. Different varieties can be used for edging, on paths, decoratively, for their scents, medicinally, and in cooking.

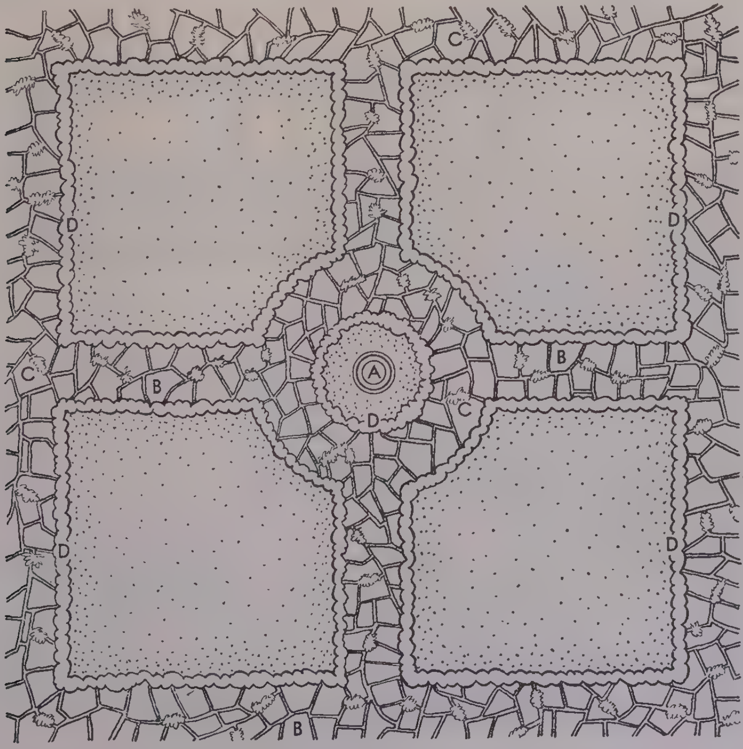
Herbs Less Well Known

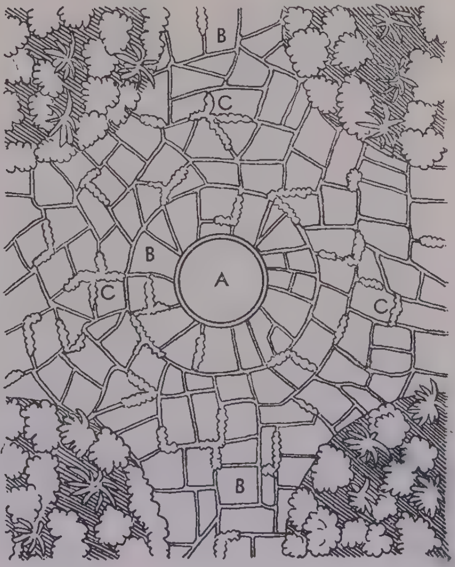
Besides the commonly used culinary herbs described there are several herbs not well known that are especially deserving of more general culture. They are particularly useful for flavouring or garnishing, and include savory, marjoram, balm, and chervil. Worthy of mention too are those plants such as chicory, horse-radish, skirret, orache, scorzonera, and salsify that were formerly grown in practically every good vegetable garden, but are now often classed as herbs. They are still occasionally listed in vegetable catalogues.

Plants having herbal uses are to be found in most herbaceous borders. They include aconite, autumn crocus, flax (*Linum* spp.), forget-me-not, nasturtium, lily-of-the-valley, violets, honesty, sea holly, veronica, and species of poppy, catmint, larkspur, primrose, pelargonium, iris, and pyrethrum.

Herbs have a wide appeal and many uses. Practically all have medicinal properties, or medicinal properties are

Below—Two designs for herb gardens. A—Sundial seat or bird lodge. B—Flagstones. C—Plants in interstices of flagstones. D (in diagram at left only)—Low herb border. The diagram at right is for a terrace garden.





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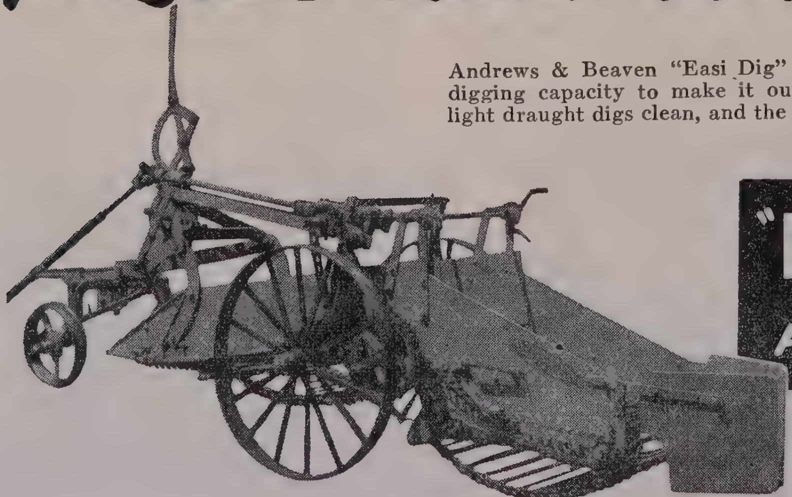

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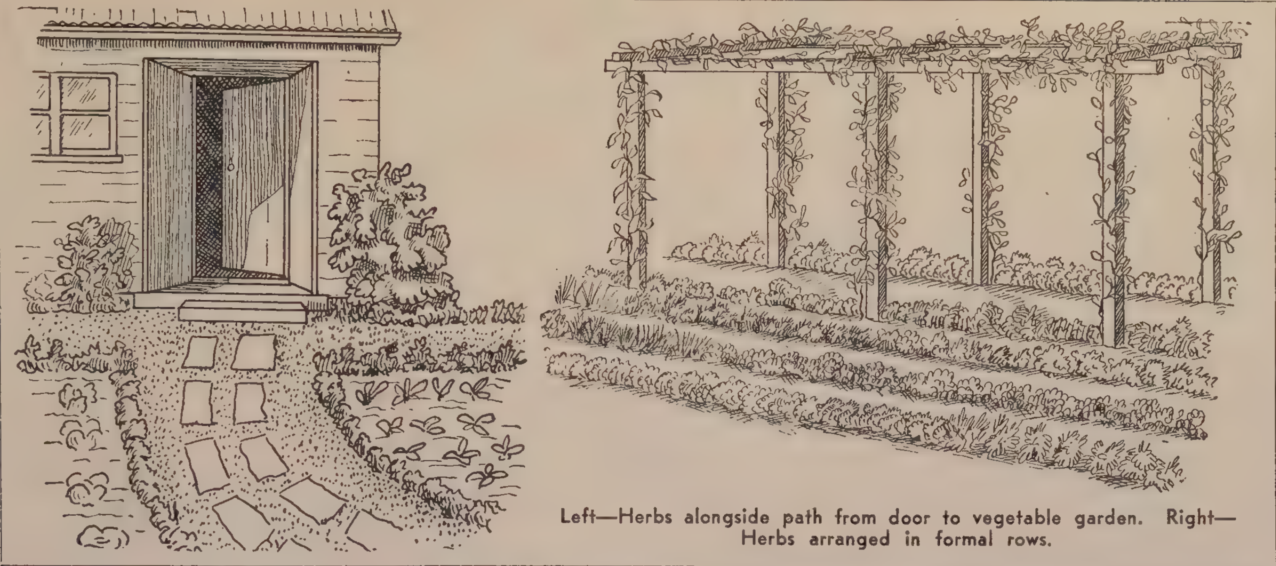


Left—Herbs alongside path from door to vegetable garden. Right—Herbs arranged in formal rows.

claimed for them, but in addition herbs are grown for their scents, for making perfumes, potpourri, dye, or confectionery, for culinary use, for filling sachets, or to attract bees.

A herb garden established in a weed-free situation needs very little attention, particularly if most of the herb plants are perennials. The lists on pages 300 and 301 are given to aid selection by those who wish to establish a herb garden. The first list is made up of annual herbs or herbs usually treated as annuals; the second of perennial herbs. The heights are given merely as a guide, as height usually varies according to variety and cultural conditions. Botanical names have been included to facilitate identification, as great confusion exists among the common names, though in a few instances where botanical names are not well established popular synonyms have been used.

Harvesting, Drying, and Storing

Herbs should be dried as quickly as possible in any airy, well-ventilated place without exposure to the sun. They are best laid thinly on a wire frame; they need not be washed unless they are soil spattered, and if washing is necessary they should not be soaked.

Flowers should be harvested by cutting close to the heads when in full bloom. Seed should be harvested when it begins to turn brown. Seeds such as dill, coriander, caraway, and aniseed usually take about 2 weeks to dry if the temperature is kept moderately high and humidity is not too great. Roots are usually dug when plants are dormant, and drying may take a considerable time (a month or more).

At right: Upper—Tansy has long been used medicinally and for flavouring it is a common roadside plant in many parts of New Zealand. Middle—Rue is a striking herb with greyish-green, much-divided leaves and bright yellow flowers. Its scent is considered pleasant by most. Its old name Herb of Grace refers to its medicinal uses. Lower—Balm is easily grown and has a pleasant lemony fragrance. It is chiefly grown for flavouring and fragrance.

Annual Herbs or Herbs Treated as Annuals

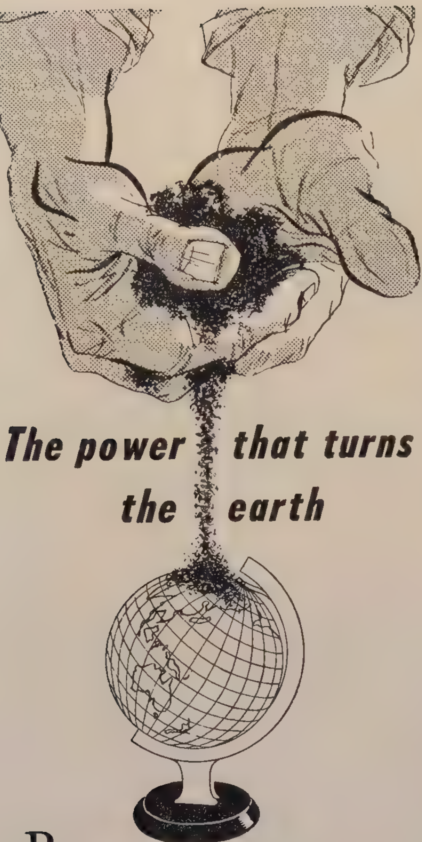
Herb	Height	Method of propagation	Comments
Aniseed (*Pimpinella anisum*), anise	2ft.	Seed	A very fragrant plant
Ambrosia (*Chenopodium botrys*), feather geranium, Jerusalem oak	2ft.	Seed	A fragrant plant having small leaves shaped like oak leaves
Basil (*Ocimum basilicum*), sweet basil	2½ft.	Seed, division	Spicy, yellow-green leaves
Basil (*Ocimum minimum*), bush basil	1ft.	Seed, division	Green or purple. A good plant for edgings
Borage (*Borago officinalis*)	1½ft.	Seed	A common weed in many places in New Zealand. Flowers bright blue
Calendula (*Calendula officinalis*), pot marigold	1ft.	Seed	
Chamomile (*Matricaria chamomilla*), German chamomile	1ft.	Seed, division	A very fragrant herb on paths, where it is usual to cut and roll it. A fairly common weed of fields and waste places in New Zealand
Coriander (*Coriandrum sativum*)	1½ to 3ft.	Seed	The plant has rather an unpleasant aroma, but it is mainly the seeds that are used
Cumin (*Cuminum cyminum*)	6in.	Seed	The seed is aromatic and the flowers white
Dill (*Anethum graveolens*)	3ft.	Seed	The seed is used widely in some overseas countries for pickles
Henbane (*Hyoscyamus niger*)	2ft.	Seed	The flowers are unusual—dull yellowish-green with purple stripes. It is mainly grown for the drug hyoscyomine
Mallow (*Malva sylvestris*)	6ft.	Seed	Less commonly used as a herb than the marsh mallow. A fairly common roadside weed in New Zealand
Nasturtium (*Tropaeolum minus* and *T. majus*). More correctly Indian cress.	5 to 9in.	Seed	*T. majus* is regarded as a weed in parts of New Zealand
Savory (*Satureia hortensis*), summer savory	4 to 5in.	Seed	The blossoms are white and snowlike
Scarlet pimpernel (*Anagallis arvensis*), poor man's weatherglass	3 to 4in.	Seed	A very common weed in New Zealand
Sesame (*Sesamum orientale* syn. *S. indicum*)	1 to 2ft.	Seed	The herb mentioned in the story of Ali Baba

Perennial or Biennial Herbs

Angelica (*Angelica archangelica*) biennial	3ft.	Seed, division	The plant is a perennial if it is not allowed to seed
Balm (*Melissa officinalis*), lemon balm, sweet balm	1ft.	Seed, division	The leaves are dark green with yellowish-white flower whorls
Bee balm (*Monarda didyma*), red bergamot, Oswego tea	2 to 3ft.	Seed, division	
Bergamot (see bee balm and mint). The true bergamot is obtained from the fruit of the Sicilian citrus (*Citrus bergamia*)			
Boneset (*Eupatorium perfoliatum*), thoroughwort, Joe-pye-weed (*E. purpureum* is occasionally called boneset)	3ft.	Seed, division	The stems seem to pierce the leaf
Burnet (*Poterium officinalis* syn. *Sanguisorba officinalis*), greater burnet, bloodwort	2ft.	Seed	
Burnet (*Poterium sanguisorba* syn. *sanguisorba minor*)	8in.	Seed	Lesser or salad burnet
Calamint (*Calamintha alpina*)	4in.	Seed	*C. acinos* is known as basil thyme. It grows 6in. high and is propagated from seed. A fragrant ground cover
Camphor plant (*Achillea ageratum*), maudline, sweet maudlin	2ft.	Seed, cuttings	Yellow flowers
Caraway (*Carum carvi*)	2ft.	Seed	Biennial. Produces the well-known caraway seed
Catmint (*Nepeta cataria*)	1½ft.	Seed, division	Garden catmint (*N. mussini*) is less favoured by cats
Chamomile (*Anthemis nobilis*), Roman or true chamomile	1½ft.	Seed, division	An annual unless cut back
Chervil (*Anthriscus cerefolium*)	1½ft.	Seed	Biennial. May die in one season unless in shade or a cool place
Chives (*Allium schoenoprasum*)	1ft.	Seed, division	Useful for edging as well as for its culinary use
Clary (*Salvia sclarea*)	4ft.	Seed	Biennial. Flowers mauve, yellow, or white. Camphor scent
Comfrey (*Symphytum officinale*), bruisewort	1½ft.	Division	Large leaves, white or reddish flowers. Needs moisture or shade
Costmary (*Chrysanthemum majus, C. balsamita* syn. *Tanacetum balsamita*), alecost, sweet mary, bible leaf, mint geranium	2 to 3ft.	Seed, division	The scent is pleasant and rather minty
Caper spurge (*Euphorbia lathyris* syn. *E. cappensis*), caperplant.	3ft.	Seed	Biennial. Caper spurge often occurs as a weed in Christchurch gardens. The young leaves differ markedly from the old. The true caper plant is *Capparis spinosa*, a trailing herb or shrub
Dropwort (*Spirea filipendula* Linn.), meadowsweet	2ft.	Seed, root division	
Elecampane (*Inula helenium*), horseheal	6in.	Seed	Bright yellow flowers
Feverfew (*Chrysanthemum parthenium*), featherfew, featherfoil	1 to 2ft.	Seed, division	A rather pretty herb
Germander (*Teucrium chamaedrys*)	6ft.	Seed, division	The flowers are rose and the leaves shiny dark green
Gilliflower (*Dianthus caryophyllus*)	2ft.	Cuttings, division	Popular mainly because of its clove scent. *Eugenia caryophyllata* is also called gilliflower
Geranium (*Pelargonium* spp.), *P. graveolens* is the rose geranium, *P. limonium* the lemon-scented geranium, *P. melissimum* the balm-scented, and *P. citriodorum* the orange-scented	1 to 4ft.	Seed, cuttings	There are besides apple-scented, coconut-scented, filbert-scented, and peppermint-scented geraniums and a number of others
Good King Henry (*Chenopodium bonushenricus*)	1½ft.	Seed, division	Ordinary fat-hen is *C. album*. The leaves were often used as spinach. It has tiny white flowers on spikes and is still sold as a vegetable in some European countries

Perennial or Biennial Herbs—*Continued*

Herb	Height	Method of propagation	Comments
Horehound (*Marrubium vulgare*), white horehound	1 to 3ft.	Seed, division	It has woolly, greyish leaves and is common in waste places in New Zealand
Hyssop (*Hyssopus officinalis*)	1½ft.	Seed, division	It has pretty, purple flowers, but there is also a less common, white-flowered variety
Lavender (*Lavandula vera* or *L. officinalis*), sweet lavender	3ft.	Seed, cuttings	There are several other useful varieties and species including *L. atropurpurea nana* (dwarf French), *L. pinnata*, *L. dentata*, and *L. pedunculata*
Iris (*Iris florentina*), Florentine iris, orris root	2ft.	Division	*I. versicolor* (1ft.) is also used for fixing scents
Liquorice (*Glycyrrhiza glabra*), common liquorice, Spanish liquorice	3ft.	Seed, root buds	
Lovage (*Levisticum officinale*)	6ft.	Seed, division	
Marjoram (*Origanum majorana*), sweet, summer, or knotted (*O. heracleoticum*), winter common, or pot (*O. onites*)	1 to 2ft.	Seed	Sweet marjoram has the finest flavour and deserves to be more widely used. It is often treated as an annual
Marsh mallow (*Althaea officinalis*)	4ft.	Root division	The flowers are rose
Meadowsweet (*Spirea filipendula* Linn.), queen of the meadow	2ft.	Seed, root division	
Milfoil (*Achillea eupatorium*), aromatic yarrow	4ft.	Seed	
Mint (*Mentha* spp.). *M. piperita* is peppermint; well-known varieties are *subcordata, vulgaris* (black), *officinalis* (white); *M. spicata* Linn. (syn. *M. viridis*) is garden mint, lamb mint, or spearmint; *M. rotundifolia* is apple mint; *M. longifolia* Huds. (syn. *M. sylvestris*) is field or horse mint; *M. requeni* is Corsican mint; *M. pulegium* is pennyroyal; *M. aquatica citrata* is bergamot, lavender, or orange mint	2 to 3ft.	Cuttings, division	In addition there are many hybrids. *M. requeni* is a splendid prostrate variety for growing on paths
Mullein (*Verbascum thapsis*) great mullein, Our Lady's flannel	7 to 8ft.	Seed, biennial	Grey-green, flannel-like leaves. Tall stalk with a thick spike of tiny yellow flowers at top
Mullein pink (*Lychnis coronaria*) rose campion	3ft.	Seed	Single cerise flowers. *L. alba rosea* is also called rose campion
Pennyroyal (*Hedeoma pulegfoides*), American pennyroyal. (English pennyroyal is *Mentha pulegium*)	6in.	Seed	Linseed. Mint scent, blue flowers
Pyrethrum (*Chrysanthemum cinerariifolium*), insect flowers	2ft.	Seed, division	Profuse, daisy-like blooms. The dried flowers are the basis of many insect powders
Poppy (*Papaver somniferum* Linn.), opium poppy	4 to 5ft.	Seed	
Poppy (*P. rhoeas*), herbal poppy, field poppy, corn poppy, shirley poppy	1 to 2ft.	Seed	
Rose (*Rosa damascena*), damask rose; French rose (*R. gallica*), apothecaries rose; sweet brier, eglantine (*R. rubiginosa*)	4 to 5ft.	Seed, division	
Rampion (*Campanula rapuncullus*)	3ft.	Seed	Tall, erect stems and delicate, lavender, bell flowers which attract bees
Rosemary (*Rosmarinus officinalis*)	3ft.	Cuttings, rarely seed	
Rue (*Ruta graveolens*), herb o' grace	2ft.	Seed, division	Lacy, bluish-green leaves, yellow blossoms
Sage (*Salvia officinalis*)	3ft.	Seed, division	The commonest varieties are the narrow-leaved or broad-leaved green sages, the narrow-leaved grey sage, and the red sage. *Salvia sclarea* is sweet clary, or clary, or clary sage
Santolina (*Santolina chamaecyparissus*), lavender cotton, cotton lavender	2ft.	Seed, cuttings	
Savory (*Satureia montana*), winter savory	5 to 6in.	Seed	A fine herb for culinary use, though inferior to summer savory
Skirret (*Sium sisarum*)		Seed, root division	Salad or pot herb little used now
Sweet flag (*Acorus calamus*)	2ft.	Seed	Fragrant roots
Soapwort (*Saponaria officinalis*), bouncing bet	2ft.	Root division	The leaves contain a substance that lathers in water
Sorrel (*Rumex scutatus*), French sorrel	1½ft.	Seed	The leaves are larger, more succulent, and not as sour as those of sheep sorrel (*R. acetosella*)
Southernwood (*Artemisia abrotanum*), old man or lad's love	3½ft.	Cuttings	Has pungent, lemony, thread-like leaves
Sweet cicely (*Myrrhis odorata*), myrrh	3ft.	Seed, root division	Not the Biblical myrrh. Fernlike, aniseed-scented leaves
Tansy (*Tanacetum vulgare*)	2ft.	Seed, root division	The leaves are fernlike and the flower heads orange colour. Tansy is a common weed on roadsides and waste places in New Zealand
Tarragon (*Artemisia dracunculus*), French tarragon	2ft.	Cuttings, root division	Long, narrow leaves and aniseed taste
Thrift (*Armeria maritima*)	9in.	Seed, division	Good plant for herb edging
Thyme (*Thymus* spp.). Varieties too numerous to list in entirety, but some of the better known are *T. vulgaris* (common thyme) and *T. serpyllum* (wild thyme or serpolet), of which there are a number of attractive varieties, including *lanuginosus*, *carnea*, and *citriodorus* (lemon thyme). Other good varieties include the Azores thyme (*T. azoricus*), caraway thyme (*T. herba-barona*), and orange or golden thyme (*T. aureus*). (For further details see page 297)			
Valerian (*Valeriana officinalis*), garden heliotrope, cats' valerian, catnip	3ft.	Seed, root division	
Violet (*Viola odorata*), *V. tricolor* (heartsease or wild pansy)	4in.	Seed, cuttings	
Woodruff (*Asperula odorata*), sweet woodruff	6in	Seed, division	Makes a lovely, sweet-scented ground cover with star-like leaves
Watercress (*Nasturtium aquatica* or *Nasturtium officinale*), common or stream watercress		Seed, root division	Garden watercress or land cress is *Barbarea praecox*. (The cress grown with mustard for salad is *Lepidum sativum*)
Wormwood (*Artemisia absinthium*)	3ft.	Seed, division	Has greyish, finely cut, fragrant leaves



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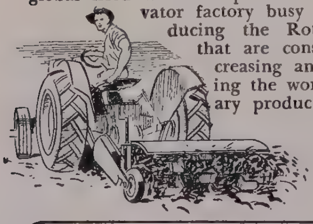

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Bloodroot, ginsing, golden seal, and self-heal. The following will tolerate part shade: Balm, bergamot, chervil, tarragon, sweet woodruff, mints, angelica, sweet cicely, parsley, comfrey, and costmary.

Grown for Foliage

Angelica, balm, basil, borage, chervil, chives, lovage, mints (various), parsley, rosemary, sage, savory, sweet marjoram, sweet bay, tarragon (French), thyme, wormwood.

Grown for Fragrance

Dwarf to medium-tall: Ambrosia, burnet, calamint, chamomile, catnip, clove pink, dame's rocket, English pennyroyal, feverfew, heliotrope, hyssop, lavender, lemon verbena, marjoram, mints, nasturtium, rue, scented geraniums (various), santolina, sage, sweet maudlin, sweet woodruff, sweet marjoram, sweet basil, thymes, tarragon, violets, winter savory.

Medium-tall to tall: Angelica, aromatic milfoil, bergamot, camphor plant, common tansy, daphne, dill, dropwort, lemon balm, lovage, rosemary, sages, sweet bay, sweet cicely, southernwood, sweet wormwood.

Herbs which Attract Bees

Basil, borage, catnip, chamomile, chicory, daphne, dropwort, germander, hyssop, lavenders, marjorams, melilot, rampion, red bergamot, rosemary, sweet cicely, sage, teasel, thyme, winter savory.

Herbs for Low Hedges

Hyssop, lavender, rosemary, santolina, germander, southernwood, rue.

Herbs for Potpourri

Any petals or leaves that have a pleasing fragrance may be used for making potpourri. Practically all the plants listed as grown for fragrance may be used, though the following list, which includes some plants not usually grown or regarded as herbs, contains some of the most suitable subjects:—

Heliotrope, jasmine, lavender, lemon balm, lemon verbena, marigold, mint, mignonette, pink, rosemary, rose, santolina, southernwood, stock, thyme, violet, wallflower.

A fixative is usual in potpourri to help retain the natural scent of leaves and petals and to aid in preserving them. Orris root is one of the most commonly used fixatives and is obtained from the powdered root of the Florentine iris (*Iris florentina*). It has a violet-like scent when dried and imparts a pleasant odour if burnt in a room. It also has a number of medicinal uses. Orris root also seems to have some colour-fixing value when used in drying herbs so that they retain as much of their colour as possible. The roots of the blue flag iris (*Iris versicolor*) are also used as a fixative when dried.

Borage can be used in salads, as a pot herb, for flavouring, or to attract bees. The crushed leaves have a fragrance reminiscent of cucumber and are used to impart a refreshing flavour to drinks. Borage is a common wild flower in New Zealand, particularly in parts of Central Otago, where its brilliant blue flowers together with yellow-flowered mullein and the scarlet hips of brier brighten the landscape.

Large roots can be split and should be turned regularly. Plants grown for their roots include angelica, lovage, orris plant, comfrey, and sweet flag.

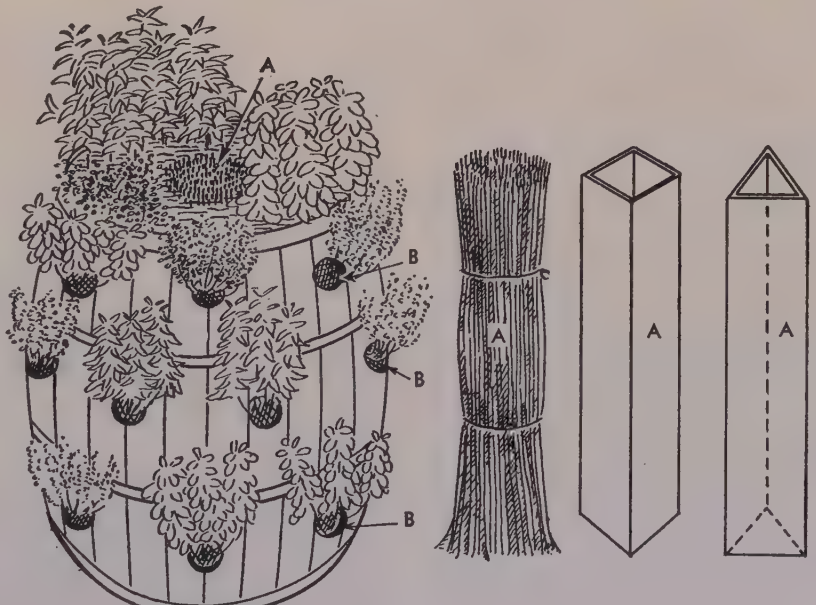
Leaves are best picked before the plant has flowered, dried until crisp, and stored in air-tight jars. Provided drying and curing are properly done, storage in air-tight jars is the most satisfactory way of keeping most herbs.

Obtaining Herbs

The common herbs such as parsley, mint, sage, and thyme can be obtained from almost all seedsmen. A few seedsmen also list some of the less common herbs, but where a comprehensive list is required it is usually necessary to go to a grower who specialises in herb production. There are several in New Zealand and at least one publishes a comprehensive catalogue.

Work for May

Provided conditions are reasonably satisfactory, sowings of some vegetables can still be made, but in districts where frosts occur, sowings during the next few months will be very restricted. There is much to be done, however, and gardeners will be attending to items such as general cleaning up, planning new shelter, and repairing tools and equipment.



In gardens were there is insufficient space for growing herbs in the ground they can be grown in a barrel or drum. Holes are cut in the barrel and the herbs planted in the same way as is sometimes used for growing strawberries. If the barrel has to be moved, the centre should be filled with a box or tightly packed straw to lighten its weight. A—Straw packing or wooden box to lighten barrel. B—Holes cut in the side.

Old rhubarb beds can be rejuvenated by lifting the roots now, remaking the beds, and splitting the roots between the plump crowns in spring before replanting.

Garden Hygiene

Cleanliness is important in the garden in assisting to check diseases and pests. In addition a clean and tidy garden is much more pleasant to work in. Gardeners should endeavour to give their gardens a "spring clean" each year, and this is usually possible during the next few months.

All rubbish unsuitable for composting should be burnt and the ashes added to the compost heap or stored dry for use later as a fertiliser. Noxious weeds should be removed where possible and the bases of hedges and surroundings of sheds tidied up. The removal of over-wintering weeds and other rubbish does much to eliminate future sources of disease infection and hiding places for slugs and snails.

Planning

The gardener would be wise to recall what crops did well last summer and which did not. He can then perhaps determine the causes for failure, endeavour to remedy these, and plan to grow in future only the most economical crops. Crops should be planned to be sown in different plots next season so that some form of crop rotation is practised. This will tend to reduce the incidence of some plant diseases and pests and will assist in preventing the loss in any great quantity of one particular plant food from the soil.

Tall crops are often best planted on the south side of a small garden and perennials like asparagus and rhubarb to one side in a plot on their own.

Garden shelter should be considered now, and if at present it is inefficient, it should be improved. If hedges or shrubs are decided on, orders should be placed now with a nurseryman. Plants like feijoas, variegated flax, and dwarf bamboos can often be planted in a mixed shelter or spaced about the garden. They not only have their utility value, but add colour and variety.

Herbs

Plants of mint, sage, thyme, and other favoured herbs can be established during the next few months. Odd plants add variety even to the flower garden, but if planted in the vegetable section are best placed in easily accessible positions.

Sowings

Results from sowings of seed during May can be very uncertain in other than the milder districts. However, in many coastal and northern districts sowings now should be quite successful. Unless soil conditions are particularly favourable, ridge sowing can be adopted for most subjects. In districts experiencing heavy frosts from now on sowing may be very risky, as cold temperatures and lifting of the soil will cause extensive losses.

Vegetables for sowing now include broad beans, in double rows 10in. apart and seed about 4in. apart (Broad Windsor, early, and Long Pod); peas (Little Marvel or William Massey), in very favourable localities only; radish (French Breakfast), in warm corners on ridges; and spinach (prickly), in well-drained, rich soils.

Plantings

Spring cabbages and cauliflowers of the varieties mentioned in last month's "Journal" can still be set out. Ridges may give better growth if soil conditions are likely to be wet and cold. Lettuces can also be set out in well-drained soils. If cloches are available, they can be used to cover lettuces on raised beds to give very early heads.

Early crops of shallots can now be set out in well-drained soils. Generous amounts of potash and phosphate will give good-quality crops. Shallots are valuable, because they are very prolific and do not occupy much space.

Silver beet plants can be set out now in most districts, as they are very hardy. They require rich, well-drained soils.

Manuring

Leaf crops will slow down in growth about this period, and during the next few months they may need encouraging with quickly available manures. Liquid animal manure the colour of weak tea or nitrate of soda (1oz. in 1 gallon of water to each 9ft. of row) will keep growth going. Liquid manures and most fertilisers are often not made available to plants during the colder periods, but nitrate of soda becomes available almost immediately.

Maintenance

Unless the soil is very wet, cultivation should be practised even during winter. Keeping the soil surface free allows good aeration and assists in keeping the soil surface warmer and drier than otherwise. Ridging is perhaps more valuable in this respect, as drainage is improved and a greater surface of soil is exposed to winter sunshine.

Drainage should be watched carefully from now on, particularly in newly established gardens. If a high water-table or excess seepage is suspected, measures to improve the position are advisable.

If adequate facilities are not available for the disposal of rubbish and composting, compost bins and incinerators would be valuable garden additions. It is unwise to burn everything, and all healthy excess plant refuse is best dug in or composted. A well-constructed compost heap is as good as a bin and does not attract flies.

Other Reminders

All remaining vine crops, tubers, tomatoes, and pods will probably need harvesting this month if damage to them is to be avoided. Asparagus beds can be cleaned up and mulched and old-established rhubarb plants lifted, and the beds remade for replanting of split crowns in spring.

All stakes from spent crops should be collected, cleaned, and stored in a dry place. Late leeks and celery should be blanched if this has not yet been done.

Garden tools should be overhauled and cleaned up, spray equipment overhauled, and shed interiors tidied as time permits.

Late attacks of pests and the establishment of fungous diseases should be watched for and immediate steps taken to quell them.

All photographs by Green and Hahn Photography Ltd.

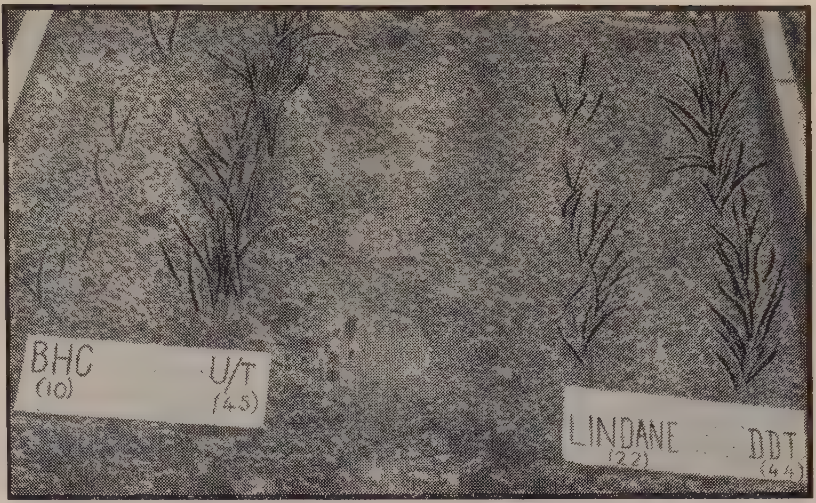
Gradient of V Drains

On page 197 of the article "V Drainage on Sand Country at Flock House Farm of Instruction" in the March issue of the "Journal" the fourth line from the top gives a gradient 1ft. in 500ft. for a V drain. This should read 1ft. in 1500ft.

B.H.C. and Lindane are Dangerous to Wheat

By A. D. LOWE, Entomological Research
Station, Department of Scientific and
Industrial Research, Ashburton

WORK at the Entomological Research Station, Department of Scientific and Industrial Research, Ashburton, over the past 6 years has resulted in D.D.T. and B.H.C. being recommended for the control of grass-grub (*Costelytra zealandica* (White), formerly *Odontria zealandica* (White)) and subterranean grass caterpillar or "porina" (*Oxycanus* spp.) at the rate of 2lb. of active ingredient per acre. Present recommendations are that these insecticides should be broadcast with farm machinery normally used for sowing, and the substance is usually mixed with superphosphate and sown through a topdresser. However, experiments have shown that the germination of wheat seed is endangered when the seed is drilled with B.H.C. or a newer preparation, lindane, and the results of these experiments are discussed in this article.



[*Department of Scientific and Industrial Research photo.*

Fig. 2—A trial plot in a field test in which B.H.C., lindane, and D.D.T. were each mixed with superphosphate and sown with wheat seed. The figures on the cards show the number of seeds which germinated in each treatment. Fifty seeds were sown in each row.

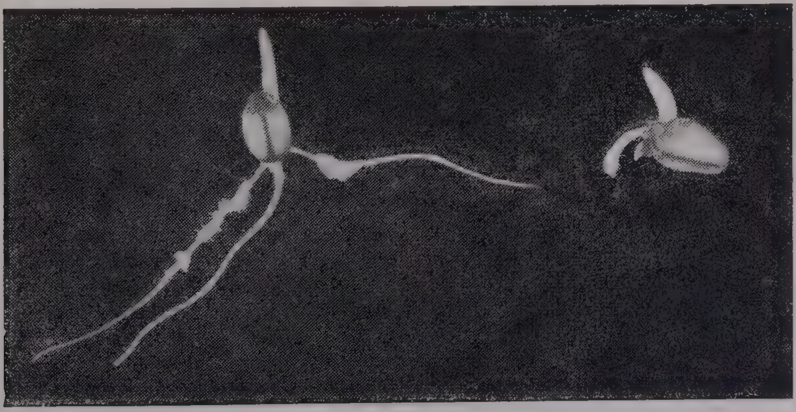
TO assist farmers fertiliser companies have prepared a D.D.T.-superphosphate "special mixture". A "Gammexane-super." is also available which gives a dosage of only ½lb. of B.H.C. (gamma isomer) per acre and which is intended for the control of porina caterpillars in established pasture.

Both farmers and merchants have made many inquiries from the Station regarding the possibility of sowing down new pasture with these insecticides and of using them as seed dressings in much the the same way as "Ceresan" or "Agrosan" is used to dress wheat. In susceptible areas the problem of grass-grub in young grass and in some cereals, especially wheat, is quite serious. With present costs of working the land and of good seed major losses, amounting in money to several pounds per acre, result from early infestation or carry-over of grub populations from previously grassed areas.

The Station has therefore set out to find an answer to these questions. Two problems are involved: 1. What are the effects on seeds, and on subsequent plants, of this close contact of seeds and insecticide? and 2. Will this method of using the insecticide give the desired control over the grass-grub? This article is concerned with the answer to the first question. Work now under way will eventually give the answer to the second.

Toxic Effects of B.H.C. on Plants

It has long been known that crude B.H.C. preparations (known variously as benzene hexachloride, "Gammexane", "Agrocide", 666, etc.) have toxic effects on plants at certain dosages. This insecticide consists of a number of isomers, which are compounds containing the same chemical elements both in identity and number but differing in properties. To distinguish these isomers they are called by various Greek letters (alpha, beta, gamma, etc.). Of these the gamma isomer, though by far the most active in insecticidal efficiency, has been claimed as not toxic to plants (phytocidal).



[*Department of Scientific and Industrial Research photo.*

Fig. 1—Comparison between wheat seedlings germinated on filter paper in the laboratory. The seedling on the left was untreated and the stunted seedling on the right was treated with lindane at a dosage equivalent to 2lb. of gamma isomer per acre.

A newer preparation known technically as lindane or gamma B.H.C. and which contains 99 per cent. of the gamma isomer of B.H.C. is included in materials now being marketed in New Zealand for grass-grub control. Three of the experiments carried out at the Station on the effect of B.H.C. and lindane on the germination of seeds gave results as follows:—

The first, illustrated in Fig. 1, showed typical damage to wheat germinated on filter paper in the laboratory. The seed was dressed with lindane at a dosage equivalent to 2lb. of gamma isomer per acre. An untreated seed (control) is on the left and the accompanying stunted seedling resulted from a seed treated with lindane. (Variety: Cross 7.)

The second experiment, shown in Fig. 2, was on trial plots in a field test. Drills were opened and B.H.C., lindane, and D.D.T., each mixed with superphosphate, were sown in the drills at the recommended dosages. Superphosphate only was sown in the untreated rows (marked U/T). Fifty seeds were then sown in each row. This experiment simulates a farmer's planting of superphosphate and seed through his drill. The plots were repeated 4 times, giving 200 seeds in all for each treatment. The total seeds germinated at 21 days were: Untreated, 182; D.D.T., 178; lindane, 112; and B.H.C., 39. No further seeds germinated. The illustration shows a typical set of four rows, with the numbers of seeds germinating in each treatment after 21 days (out of 50 sown). (Variety: W.R.I. Yielder.)

A further field experiment in which the same treatments were used, but where the insecticide-superphosphate mixtures were broadcast and then raked into the top inch of soil and the seed was then sown, gave germination of wheat equal to rows receiving superphosphate only (control). But the resulting plants in the B.H.C.- and lindane-treated areas showed some variation from normal. Sixty-five days after sowing, approximately a third of the plants on the B.H.C. area showed only about 50 per cent. of the growth of untreated rows, and lindane-treated plants were certainly less vigorous than untreated ones. (Variety: Hilgendorf.)

Failure of Ashburton Crop

The following experience also illustrates the danger of B.H.C. to germinating seeds. An Ashburton farmer troubled with non-germination of wheat requested assistance from the Station. The area was inspected by a member of the staff, who found that the farmer, hoping to prevent grass-grub attack, had sown the wheat down with various bags of insecticide-superphosphate mixture which he had had over from treating paddocks for grass-grub and porina. Included in this manure were several bags of "Gammexane-super.". These had been tipped into the manure box and used along with D.D.T.-superphosphate from two different sources. Wherever a bag of "Gammexane-super." had been used the wheat failed to appear above the ground.

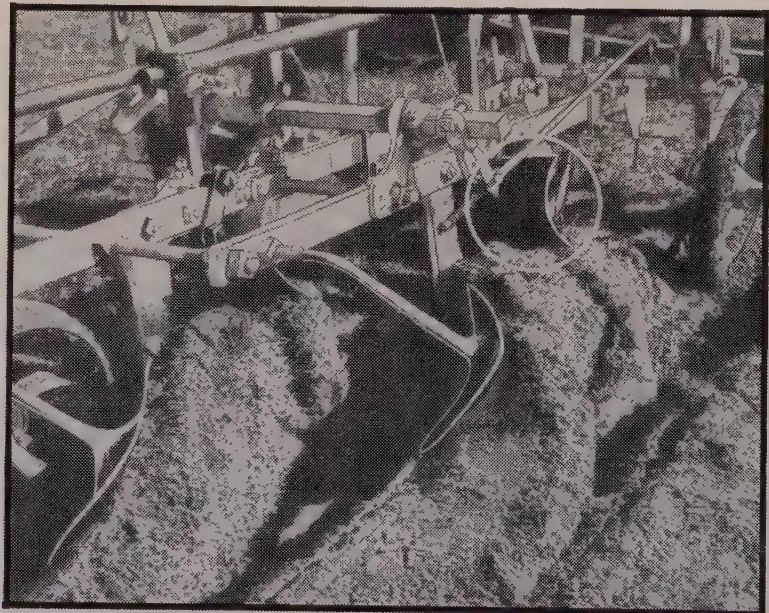
An examination of the drills showed typical B.H.C.-damaged grain similar to that shown in Fig. 1. The "clubbed" roots and the stunted, thickened shoot were apparent on every grain. It should be noted that in this practical instance of field damage the dosage was theoretically only ½lb. of B.H.C. (gamma isomer) per acre when the material was broadcast. However, when drilled in 7in. drills, as in this instance, the treated superphosphate was concentrated in the drills and probably represented a contact with the grain equal to 3 to 4lb. of B.H.C. (gamma isomer) per acre. So even this seemingly low dosage of ½lb. of B.H.C. (gamma isomer) per acre is sufficient to cause major damage when sown in intimate contact with the seed. This particular paddock was eventually reworked and sown again. (Variety: Cross 7.)

Readers will naturally ask what the Station does recommend for the control of grass-grub in wheat. In view of the results recorded it cannot be too strongly emphasised that on no account should any B.H.C. or lindane preparation be drilled with wheat.

At present recommendations for the use of D.D.T. for control of grass-grub are confined to broadcasting the material on the surface of the ground. The recommended dosage of 2lb. of D.D.T. (p.p.i.) per acre may be applied by various methods. The insecticide may be mixed with a filler (superphosphate, lime, or sand) to give bulk and broadcast on fallow ground at the final harrowing of the seed-bed, or it may be similarly broadcast at the sowing of wheat.

Where it is desired that superphosphate be conserved for drilling in with the grain the insecticide may be mixed with a filler and broadcast after the seed has been sown. Where wheat is being oversown with grass this last method is particularly useful for protecting the grass. All these methods, however, must be regarded as being in the nature of trials in respect to the protection afforded to wheat. Work now being carried out at the Station will show which method will give the best protection and more definite recommendations will be possible later. Those who are troubled by grass-grub in wheat may find some alleviation meantime by using one of these suggestions.

Ploughing for Clean Seed-beds



TIME and cost in working down a seed-bed can be saved if ploughing is done so that surface vegetation is buried. When lea land is being ploughed skim coulters are very useful. The form shown in the illustration consists of a curved steel blade attached behind the coulter. As the furrow lifts, this skim coulter trims off the edge of the turf and allows it to fall to the bottom of the furrow to be completely buried, and there is no grass or turf left ready to develop new growth between the edges of the furrows. On land that has old turf or bad weed growth the skim coulter plays a valuable part.

Where deep ploughing is warranted and there is heavy growth of rushes or scrub a heavy chain should be attached to the beam so that it drags the tall growth under the turning furrow. Where surface trash or tall growth is buried and evenly incorporated there is less trouble from weed competition and subsequent cultivation is reduced considerably.

A little time spent in attention to these items will amply repay in time saved in working down for the final seed-bed.

—*J. R. MURRAY, Instructor in Agriculture,*
Department of Agriculture, Hamilton

Farm Crops in New Zealand

CROPPING still holds an important place in New Zealand farming, despite the great reliance placed on pasture and grass saved in various forms. For that reason a new Department of Agriculture bulletin, "Crop Production", should interest farmers in all parts of New Zealand. It deals with all the main cash and fodder crops, with recommendations on such aspects as fertilisers, varieties, seed-bed preparation, and harvesting.

Cropping after the breaking in of land and before grassing or before the resowing of run-out pasture can be very payable. Information about soil, climate, and other requirements for various crops included in "Crop Production" should enable farmers to proceed on sound lines.

"Crop Production" should be of special interest to farmers who have land suitable for wheat but who are diffident about growing the crop because of lack of experience with it. The urgent need for a greater wheat acreage has been emphasised repeatedly and a much greater acreage could be grown in the southern part of the North Island particularly.

A well-illustrated and attractively produced bulletin of 156 pages, "Crop Production" should prove a standard reference for farmers, agricultural students, and seed distributors. It is available from main offices of the Department of Agriculture at 2s.

Irrigation of Supplementary Fodder Crops

RAPE, soft turnips, swedes, mangolds, and sugar beet are among those crops which can be successfully irrigated with resulting substantial economic increases in yield. The information contained in this article by A. D. Hall and B. A. Lauder, Research Officers, Department of Agriculture Winchmore Irrigation Research Station, is based on general experience and a limited amount of experimental work on growing these crops under irrigation at Winchmore. It should be noted that to date cultural methods, apart from irrigating, have not differed from those normally employed under dry-land conditions. The recommendations should not be regarded as final or complete, but merely as an initial statement of what has been found reasonably successful. Further trials aimed at solving some of the existing problems relating to varieties, seeding rates, and methods of sowing and manuring, as well as problems of irrigation, will enable more detailed and definite advice to be offered.

THE water requirements of rape, soft turnips, and swedes are not yet known, and no cheap and accurate field method for soil moisture determination is available to the irrigator at present. Because of this and the fact that the weather can neither be precisely predicted nor controlled, irrigation in an area of erratic summer rainfall such as Mid-Canterbury is a somewhat hit-or-miss affair to the extent that one or more irrigations may be so closely followed by heavy rainfall that they have no real effect.

Rape

Crops of rape capable of fattening 20 store lambs per acre have been grown in dry seasons on land which without irrigation would produce less than half the quantity.

The number of irrigations required to do this depends on the season and the soil type, but is not likely to exceed four of 6 to 7in. each or a total of 30in. for the season.

The aim in irrigating rape should be to make available to plants sufficient supplies of water for vigorous growth throughout the growing period of 10 to 14 weeks. Rape sown in October will normally require less water from emergence to maturity than rape sown in December, but the latter may produce feed at a time when pastures have gone off and thus be of greater value for finishing off lambs or fattening stores.

Pre-irrigation

The first opportunity of irrigating the rape after sowing will come 2 to 3 weeks after the plants emerge. Therefore, if the soil does not contain enough moisture at sowing time to last for 4 to 5 weeks, the paddock should be irrigated before sowing. Pre-irrigation may entail extra cultivation before sowing, but the increased yield should more than compensate for this. It is important to get the land fairly well consolidated before pre-irrigation, especially where checks are long, if watering is to be carried out at a reasonable rate.

Irrigation after Sowing

Though at present irrigators have no cheap and accurate way of determining the moisture content of stony soils, careful observation will enable an intelligent decision to be made on whether or not to irrigate. Examination of the soil to a depth of 4 to 6in. in several representative parts of the paddock should give sufficient information on the minimum number of irrigations required to keep soil moisture at good levels. The degree of wilt, if any, on plants will also aid in indicating water requirements.

The first irrigation after sowing should be delayed as long as possible and at least until plants have leaves 2 to 3in. long and are robust enough to withstand without damage to stems and roots any surface cracking of the soil which may follow irrigation. If the seedlings take 10 to 14 days to come through the ground, and a further 2 to 3 weeks to grow to a reasonable size, the time between sowing and first irrigation will be 4 to 5 weeks. The time of later irrigations can be determined more accurately in the field by careful examination of soil and plants at intervals of 2 to 3 weeks. In the driest season irrigation should not be required more often than every 3 to 4 weeks, and in wetter years the interval may be nearer 6 weeks, so that the total number of irrigations may vary in different seasons from as many as four or five to as few as one or even none, the number being always determined as far as possible by the moisture content of the soil.

Feeding Value of Irrigated Rape

The feeding value of irrigated rape may be judged from the fact that liveweight gains of up to 3lb. per week have been obtained in a trial during the 1951-52 season with Romney store lambs. In this trial an interval of 10 days was allowed between the final irrigation and grazing. This practice has the effect of increasing the dry-matter content of the rape, but may not be essential for successful fattening of lambs.

Irrigation may be used to delay the maturity of rape. A crop which is likely to get past its best because of dry conditions before it can be fed

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HEADING PHOTOGRAPH: An area at the Winchmore Irrigation Research Station, showing irrigated swedes on the left and non-irrigated swedes on the right.

should be given an irrigation to keep the plants from wilting and drying off too much, with loss of both feeding value and bulk.

Soft Turnips and Swedes

Soft turnips and swedes may be satisfactorily irrigated with the same methods as those described for rape. If cultural conditions are satisfactory, and these need not be varied from those normally used on dry land, yields of 15 to 30 tons per acre from season to season can be expected on light-medium land. All varieties so far grown have given reasonably good yields. These include, of the common varieties of swedes, Superlative, Calder, Grandmaster, Sensation, and Resistant, and of soft turnips Green Globe and York Globe.

In dry years aphides and diamond-backed moths are as great a cause of poor crops as lack of moisture. It therefore seems worth while to sow at least part of the swede crop with the variety Sensation, which has considerable resistance to both these pests.

Pre-irrigation

The decision on whether to pre-irrigate or not must be made when the final cultivation has been done and the paddock is ready for sowing. The soil will only then be consolidated enough for being watered at a reasonably rapid rate. When the competition of pasture and other crops for water is being considered it would seem best to pre-irrigate only if the soil is dry and does not hold sufficient water to last the seedling plants, whose water requirements are not large, for 3 to 4 weeks.

Irrigation after Sowing

The time of the first irrigation after sowing in relation to the size of the plants is likely to have an important effect on the final yield. Watering too early, which in practice may be taken to mean watering sooner than 4 weeks after sowing, can lead to crop failure through surface cracking or, in places where drainage is poor, through water-logging. Plants should have leaves at least 2 or 3in. long at the time of the first irrigation.

Later Irrigation

The demand of the crop for water increases as the season advances, reaching a peak in February. Rainfall apart, the frequency of irrigation will need to be increased as the plants increase in size, but if the best use is to be made of the irrigation water available, rainfall must as far as possible be taken into account. At present the irrigator can determine the required frequency only by examining the soil by hand and eye to a depth of, say, 6in., and by noticing whether plants are wilting. Plants can, of course, wilt temporarily and without harm in the full heat of summer days even when soil moisture is adequate and immediately recover when the temperature falls. It is wilting associated with dry soil which indicates an urgent need for water from either rainfall or irrigation. Delay in replenishing the soil moisture at this stage will result in permanent damage to the crop and a decreased yield.

Though no trial has yet been carried out to investigate the feeding value of irrigated turnips and swedes, observations show that they are at least equal in feeding value to crops grown on dry land.

Successful Culture with Irrigation

The following points are important for success in the culture of rape, swedes, and turnips under irrigation.

1. The paddock should be in good heart.

2. The paddock should as far as possible be prepared so that the whole area can be evenly covered with water.

3. If swedes are to be grown, the area should be topdressed with borax at 15 to 20lb. per acre a few weeks before sowing and the borax harrowed in.

4. Adequate phosphate, say, 1 to 2cwt. of "super. compound" per acre, should be sown with the seed. If the soil is dry at sowing, a mixture of "super. compound" and lime in equal proportions should be used to avoid seed injury.

5. One hundredweight of "super. compound" drilled across the crop when plants are about 3in. high may give a payable increase in yield.

6. The paddock should be pre-irrigated if the soil is dry at sowing.

7. Subsequent irrigations must be given according to the needs of the crop as determined by careful periodic examination of plants and soil.

The first irrigation after sowing should not be given sooner than a month, when plants should have leaves 2 to 3in. long.

Mangolds and Sugar Beet

A crop usually grown on heavy land for dairy cows and pigs is now being grown successfully on irrigated light land at the dairy farm on the Research Station. The ability to grow a good crop of mangolds and sugar beet is important, as a good supply of these long-keeping roots will act as a buffer against feed supply variations, particularly in the spring before the flush of grass growth.

Soil and Climate

Mangolds and beet grow best on deep, fertile, well-drained loams. At Winchmore the land consists of a crust of soil some 15 to 18in. deep on a bed of shingle. With this formation the soil tends to dry out rapidly during summer, and under these circumstances mangolds and beet could not be considered as a farm crop unless irrigation was available.

Varieties

As Yellow Globe mangolds, sugar beet, and fodder beet have been grown successfully, there is no reason why other varieties of mangolds and sugar beet should not do equally well.

Place in Rotation

Mangolds and sugar beet on a dairy farm should follow old grass or lucerne which is due for renewal. The soil after pasture is in a high state of fertility. Additional fertility may be gained by feeding out as much hay as possible on the paddock before ploughing.

Land Preparation

To gain a good tilth ploughing should start in winter. To break up the turf a couple of grubbings with a narrow-tine grubber before ploughing may be advisable. The land should lie in the furrow until September, when spring cultivation should be started.

The land should be worked deeply, as mangolds and sugar beet are deeply rooted. The animal and plant residues should by the time of sowing be thoroughly rotted and mixed with the soil.

Sowing and Manuring

A good manurial treatment is 4cwt. per acre of an equal mixture of superphosphate and blood and bone. If the crop is to follow lucerne, 1cwt. of potash also may be of advantage. The seed may be sown in 28in. rows on the flat or on ridges. Ridges are preferred at Winchmore, as they enable intercultivation before the crop germinates. The seed should be sown between mid-October and early November, but preferably in mid-October, since mangolds take a long time to mature. Sowing earlier than mid-October should be avoided, as the mangolds and sugar beet may bolt to seed. A sowing rate of 4 to 6lb. of seed per acre is advisable; with the larger sowing fewer gaps are left in the crop.

Thinning and Intercultivation

The object of thinning is to gain the optimum number of plants per acre. Thus if the crop were thinned to from 8 to 12in. apart, moderate-sized roots of high dry-matter content would develop.

Mangolds and sugar beet germinate in clumps of 2 or 3 plants. This is due to the seed being contained in a corky capsule. Thus thinning should be done at the two or three-leaf stage, when the plant which remains will not be unduly damaged by the uprooting of the other plants. Any weed growth should be cleared during thinning. Intercultivation and irrigation are joint undertakings, since irrigation tends to stimulate weed seed germination. Mechanical intercultivation should begin as soon as weeds strike after irrigation and should be repeated until about late February, when the leaves of the crop meet across the rows, thus stifling the weeds.

The number of irrigations that mangolds and sugar beet require vary with the rainfall. The aim of the irrigator should be to keep the soil on the average moist and the crop thriving. The general rule is, then, to irrigate when the soil starts to dry out, because the date of the next rainfall is unknown. Much is to be gained by this rule, as there is a natural tendency to delay irrigation, thus checking the crop. Mangolds and beet suffering from lack of moisture are easy to spot, as the leaves have a dark green, crinkled appearance, whereas thriving plants have a lighter green and more erect foliage.

Harvesting and Yields

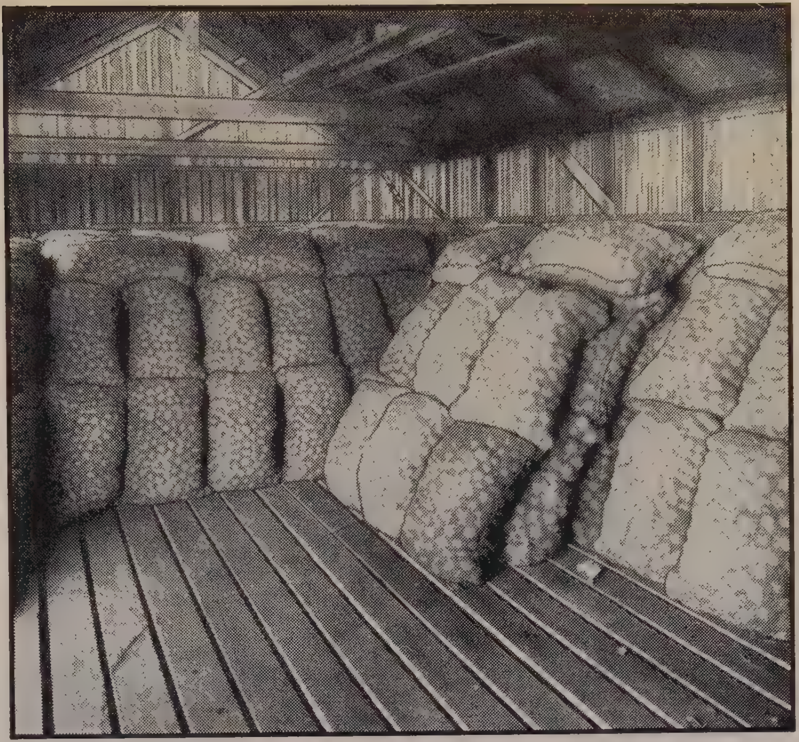
Mangolds ripen about June, when they should be pulled and pitted as usual. Sugar beet may be pulled as required and fed to pigs immediately. At the Research Station yields of 26 tons per acre of mangolds and 20 tons of sugar beet including tops have been obtained with the procedure described.

◆

Storage of Onions

By A. A. POWELL, Storage Specialist,
Department of Agriculture, Wellington

THE economic value of the Dominion's onion production will be appreciated when it is realised that approximately 1200 acres are planted with onions yearly and the estimated average production is about 9 tons per acre. The main areas of production are Pukekohe, Opiki, and the Marshland district in Canterbury.



Interior of shed illustrated below, showing method of stacking cental bags of onions.

EACH season portion of the crop is placed in storage after it is harvested in April to supply the markets until the new season's crop becomes available in December. Storage is largely carried out by growers in well-ventilated, common storage sheds, and in Canterbury, owing to low atmospheric temperatures, outside storage is practised, as the initial cost of this method of storage is comparatively low. This method can be also used for emergency storage when necessary.

Harvesting

Dry, sunny weather is ideal for drying onions in windrows in the field during harvesting, as under these conditions the moisture given off by the skins and stem tissues evaporates quickly. High humidity brings about condensation of moisture with the added possibility of the development of neck rot, *Botrytis alli*, which can cause heavy losses during harvesting and storage. Rainy weather is detrimental to both harvesting and storage. During storage from August onward losses in stored onions from rotting may be as high as from 15 to 60 per cent.

As disease infection and consequent decay is so important in onion raising, care should be taken to destroy diseased bulbs and tops after harvesting, and also diseased bulbs and loose skin sorted out during storage.

Storage

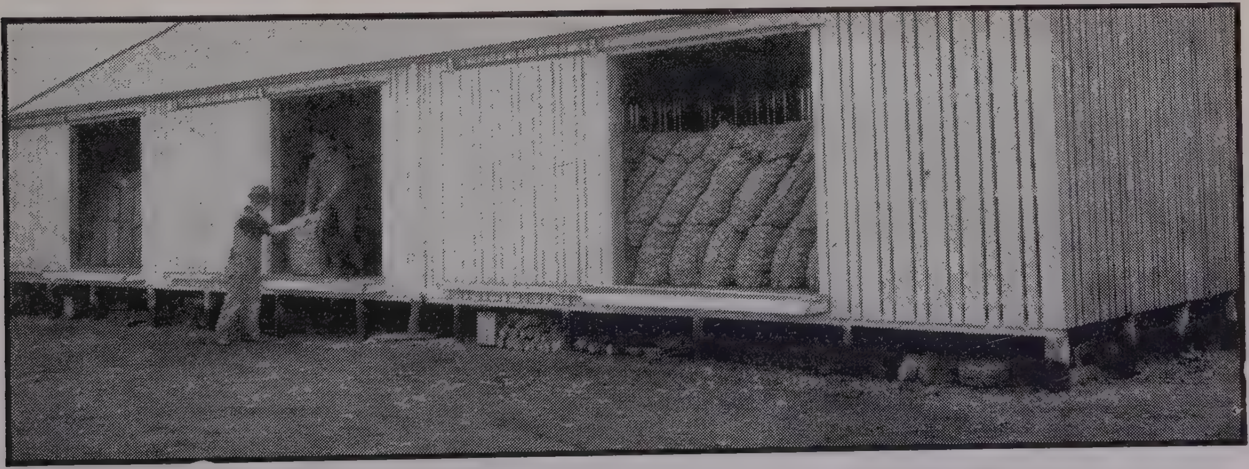
Storage in well-ventilated, common storage sheds is fairly successful in Canterbury, as average temperatures during winter are sufficiently low, but from August onward, owing to higher temperatures, there is a danger of losses increasing from sprouting.

The range of temperatures between 48 and 60 degrees F. appears to be most conducive to sprouting of onions, 60 degrees F. being the optimum temperature. At 72 to 85 degrees sprouting of firm, sound onions is negligible and at 90 to 95 degrees there is practically no sprouting except in rot-infected or otherwise-diseased bulbs, which quickly deteriorate at these higher temperatures. Loss of moisture and weight becomes excessive at temperatures higher than 72 degrees.

During any form of common storage onions should not be exposed to direct sunlight, as this tends to promote early sprouting of the bulbs.

Selecting Bulbs

Bulbs selected for long storage should be hard and free from disease. Pukekohe Longkeeper variety grown from Government-certified seed is



Well-ventilated onion storage shed on a property at Marshland, Canterbury.

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recommended, as use of this seed should ensure against bulbs having an inherent early-sprouting tendency.

The selection of bulbs that are grown for seed is important, as this has a decided influence on the storage quality of the bulbs grown from the seed.

Refrigerated Storage

For successful refrigerated storage bulbs should be hard and free from disease. A uniform temperature of 32 degrees is sufficiently low to keep sound onions dormant.

Dry storage conditions with relative humidities from 70 to 75 per cent. are essential and storage in crates is preferable. At the higher humidities beneficial for keeping other vegetables, onions tend to make root growth.

Care should be taken not to store onions with other food commodities that are subject to taint.

Common Type of Shed

In recent years growers in Canterbury and elsewhere have erected sheds of special design and construction for common storage. The floor level is usually about 2 to 3ft. above ground level to correspond with the height of the tray of a motor truck. This height also provides ample space for air movement under the floor of the shed and upward through the open-slatted flooring, which is of 6in. x 1in. timber spaced 1in. apart. The sides of the shed are vertical battens 3in. wide spaced ½in. apart to provide additional air movement within the shed. The main advantage of this type of storage shed is that it allows the prevailing winds to dry the onions and keep them as dry and cool as possible during storage.

Dimensions and Capacity of Shed

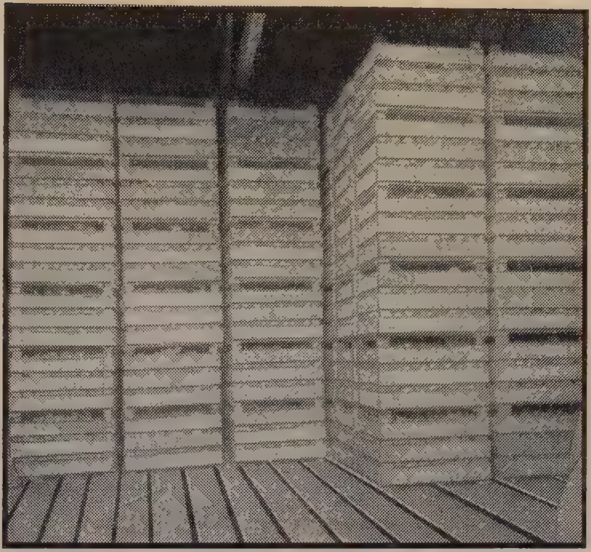
A storage shed 68ft. x 24ft. and with an 8ft. stud should accommodate approximately 90 tons of onions stacked in cental bags as shown in the upper illustration on page 309 or approximately 130 tons in crates.

Crates for Stored Onions

Strongly constructed, well-ventilated crates for harvesting and storing are a sound investment. Crates having inside dimensions of 19¼in. x 15½in. x 10½in. and corner posts extending 1½in. above the sides are recommended. The crates can be made of *Pinus radiata*, the side slats being 3in. by ⅜in. spaced 1¼in. apart. Each crate will hold approximately 60lb. of onions.

Advantages of crates are that they are lighter and easier to lift than cental bags, they save storage space, and when they are properly stacked (leaving 2in. air spaces between the rows of crates and ½in. or finger room between the sides) the tiers are well ventilated. (See the illustration at right.)

The use of crates also facilitates sorting, which has to be done to check the condition of bulbs and to remove unsound ones.



Onions stored in special 60lb. crates in a storage shed on a property at Marshland, Canterbury. Spaces are provided between the tiers of crates for air movement.

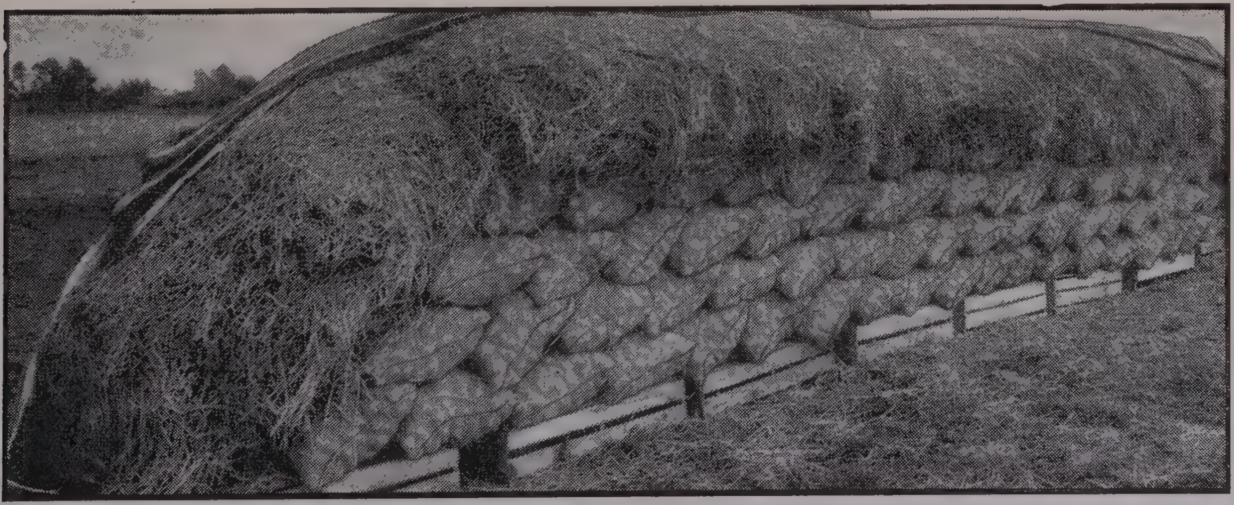
Stacking Cental Bags

In storage sheds cental bags are stacked one on top of another in single rows, two bags vertically one on top of the other and a third horizontally on top. To ensure good ventilation between the rows of bags 4in. to 6in. air spaces should be left between rows. When stacked for storage the bags press against each other in the rows and so reduce air movement.

Outside Storage

Outside storage of onions has been used by growers in Canterbury for many years and single stacks of over 80 tons have been common. Good results have been obtained with such storage when seasons are favourable for onion production and bulbs are of good keeping quality and comparatively free from disease.

High, dry ground should be selected for an outside storage stack. Bales of straw or empty crates are used by some growers to form the bases of stacks. The bales are placed flat, three bales wide, lengthwise across the width of the stack and open spaced. The first layer of cental bags is placed on the base lengthwise across the stack, with the mouths or tops of bags facing inward. The outside ends of the bales of straw or crates forming the base of a stack should be about 2in. under the ends of the bags forming the outside of the stack to prevent rain from striking the crates or baled straw and penetrating under the bottom layer of bags. This precaution



Outside storage stack containing 8½ tons of onions on a property at Marshland, Canterbury. The hessian cover has been removed to show the method of placing straw over the top and sides of the stack to form a roof.

will prevent the bottoms of bags from becoming wet and causing subsequent rotting.

If baled straw is not available for the base of the stack, timber may be used, but only perfectly dry timber should be used, as green, damp timber may rot the bags resting on it.

Stacking Bags in Outside Storage

It is important that an outside stack should not be wider than two bags placed lengthwise across the stack. The ends of the stack should be carefully constructed to stabilise the stack. In some stacks the bags are crossed in alternate layers. A stack should be from four to five layers high and one row of bags should be placed lengthwise along the top of the stack to round off the top and so run off the rain when the stack is covered with straw and a hessian covering.

The outside storage stack shown in the illustration on page 311 contains 8½ tons of onions, but in Canterbury outside storage stacks of 80 to 100 tons are not uncommon.

To permit the sun to assist in maintaining dry conditions on both sides, stacks are usually constructed running north and south. One side of the stack is exposed to the morning sun and the other to the afternoon sun. These outside storage stacks are frequently placed under trees or hedges as a protection against driving rain.

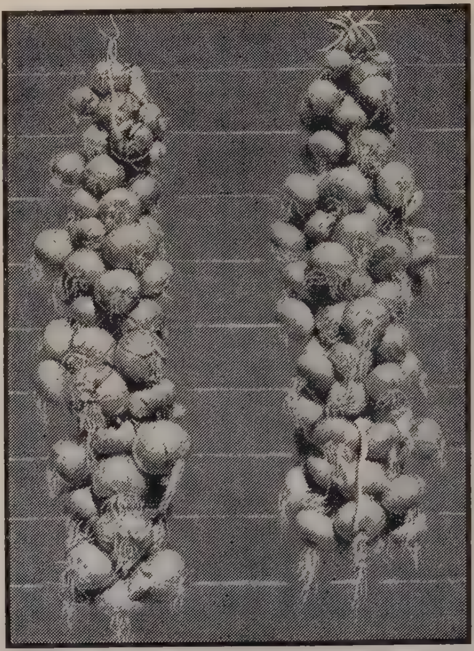
When the stack is completed 1ft. of dry straw is placed over the top of the stack and domed off and brought over both sides to form a well-sloped roof, which is then covered with a strong hessian covering brought well over both sides of the stack and firmly tied down to stakes about 3ft. out from the base. Empty sacks may be opened up and sewn together to make a covering. It is important that rain should be run off the stacks, and they should be specially shaped for this purpose.

Main Precautions

The main precautions in storing of onions are:—

1. Careful selection of onions is essential for long storage. Bulbs should be hard and thoroughly dried out in the field during harvesting.
2. Under refrigerated storage a uniform temperature of 32 degrees F. is sufficiently low and relative humidity between 70 to 75 per cent. should be maintained. These conditions in properly ventilated storage will keep sound onions dormant. Onions should not be stored in a chamber with foods that are subject to taint.
3. Weather conditions are rarely favourable for drying the skins and stem tissues of the bulbs thoroughly in the field; therefore dry, well-ventilated storage conditions are essential.
4. Sorting of onions is necessary during storage to remove faulty bulbs.
5. Loose skins and rotted or sprouted bulbs should be destroyed after harvesting and during sorting in store, as disease infection and consequent rot development are important in onion raising.

Storing Home Garden Onions



A reliable method for keeping onions is to string them and hang them in a well-ventilated, dry position in a shed. They should be away from direct sunlight, which tends to promote sprouting.

All photographs by Green and Hahn Photography Ltd.

Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during May as follows:—

1XH Hamilton, 12.33 p.m.

7 May—"The Redwater Problem", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

14 May—"Problems of the Month", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

21 May—"Farming as a Career", by J. Shine, Federated Farmers, Hamilton.

28 May—"Use of Molybdenum in Topdressing", by E. B. Davies, Department of Agriculture Soil Research Station, Rukuhia.

1YZ Rotorua, 7.15 p.m.

14 May—Y.F.C. talk, by Rotorua district committee of Federation of Young Farmers' Clubs.

28 May—"Winter Disease Problems in Sheep", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

2ZA Palmerston North, 12.33 p.m.

5 May—"You and your Ewe", by W. W. Hubbard, Livestock Instructor, Department of Agriculture, Palmerston North.

11 May—"The Turnip Crop", by A. A. Duncan, Instructor in Agriculture, Department of Agriculture, Wanganui.

18 May—"Winter Work around the Milking Shed", by L. W. Scott, Farm Dairy Instructor, Department of Agriculture, Palmerston North.

25 May—"Y.F.C. Session", by I. G. Tabor.

2XP New Plymouth, 8 p.m.

7 May—"Getting the Best out of New Pastures", by A. C. Burgess, Instructor in Agriculture, Department of Agriculture, New Plymouth.

21 May—"Winter Work round the Milking Shed", by J. M. Kristensen, Farm Dairy Instructor, Department of Agriculture, New Plymouth.

28 May—"Management of Pigs from Birth to Slaughter", by C. M. Bailey, Supervisor, Taranaki District Pig Council.

3YA Christchurch

4 May (12.20 p.m.)—"Some Comments on Farm Drainage in Canterbury", by J. F. Scott, Farm Drainage Officer, Department of Agriculture, Christchurch.

14 May (12.33 p.m.)—Review of "New Zealand Journal of Agriculture", by E. G Smith, Fields Instructor, Department of Agriculture, Rangiora.

21 May (12.33 p.m.)—"Safety in the Home", by E. Unwin, Field Officer in Rural Sociology, Department of Agriculture, Christchurch.

28 May (12.33 p.m.)—"The Farm Improvement Scheme", by R. Stuart, Field Economist, Department of Agriculture, Christchurch.

4YA Dunedin, 9.15 p.m.

6 May—"Extension Division Activities", by A. G. Elliott, Fields Superintendent, Department of Agriculture, Dunedin.

20 May—"Horticulture Division Activities", by S. Frew, Horticultural Instructor, Department of Agriculture, Christchurch.

Regular Sessions

1XH Hamilton, Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (Report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (Waikato stock review).

1XN Whangarei, Mondays at 8 p.m., Wednesdays at 8 p.m. (Northland stock market report), Fridays at 8 p.m.

1YA Auckland, Mondays at 7 p.m. (Auckland stock market report), Tuesdays at 12.35 p.m., Wednesdays at 7 p.m., Thursdays at 12.33 p.m.

1YD Auckland, Thursdays at 7.30 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock review), fortnightly on Tuesdays at 12.33 p.m. (Federated Farmers' session), Tuesdays at 6.55 p.m. (Frankton stock market report), Thursdays at 12.33 p.m., Thursdays at 7.15 p.m. (farm talks alternating with session for Bay of Plenty farmers), fortnightly on Fridays at 12.33 p.m. (pig council talk).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m.

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8 p.m. (stock review).

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.33 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Tuesdays at 8 p.m., Thursdays at 8 p.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m.

3YZ Greymouth, Thursdays at 12.33 p.m.

4YA Dunedin, Wednesdays at 7.20 p.m., Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m. and 7.15 p.m., Tuesdays at 7.15 p.m. (Lorneville stock market report), Thursdays at 12.33 p.m.

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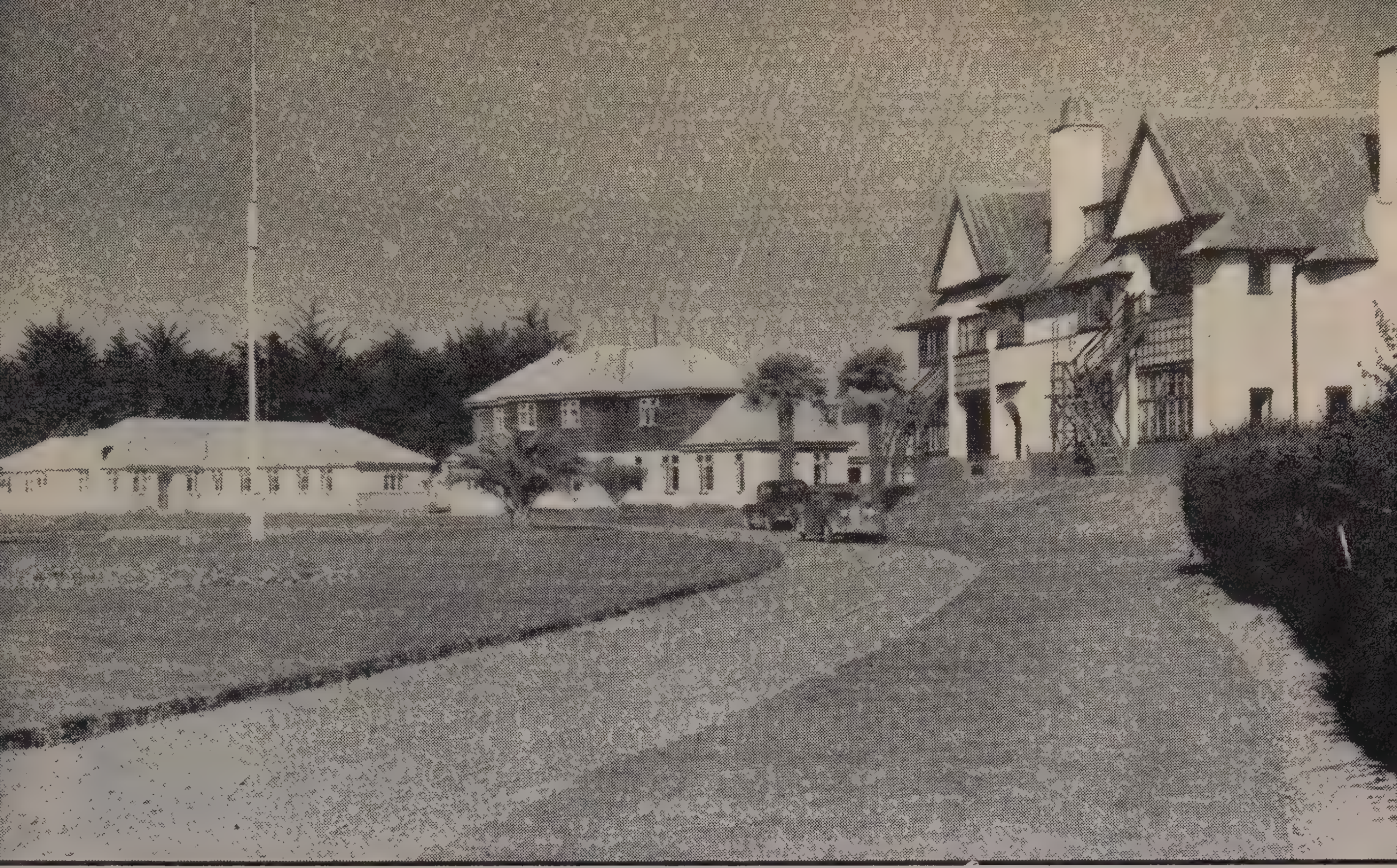


Training Course at Flock House Farm of Instruction

By W. L. HARBORD, Fields Instructor, Department of Agriculture
Flock House Farm of Instruction

WHEN Flock House Station, Bulls, was established in 1924 through the New Zealand Sheepowners' Acknowledgment of Debt to British Seamen Fund it was available only to the sons of British seamen who had lost their lives during the 1914-18 war. The property was acquired during February 1937 by the New Zealand Government and since then has been operated as a farm of instruction under the direction of the Extension Division of the Department of Agriculture. This is the last of four articles on Flock House which have appeared in consecutive issues of the "Journal" since January; the other three dealt with development work on the station.

THE aim at Flock House Farm of Instruction is to train youths between the ages of 15 and 18 years in farm practices to give them an insight into work on various types of farms and how the work should be carried out.

Fat Lamb Farm

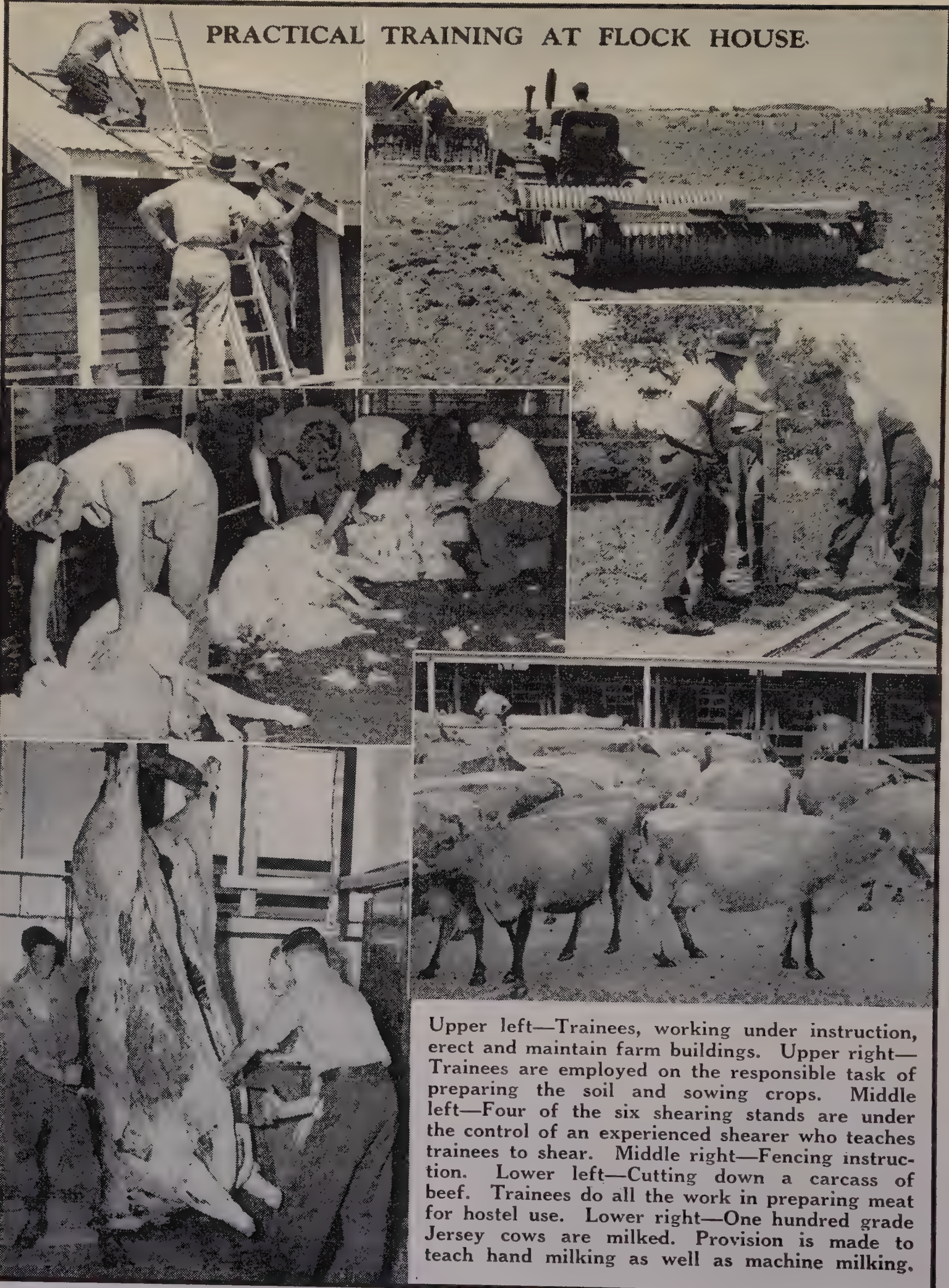
During 1949 an area of 500 acres of sand country was set aside for farming as a fat lamb unit. This farm has been developed rapidly and today carries 850 Romney breeding ewes. Here trainees working under supervision have erected new main and subdivision fences, built a woolshed and sheep yards, and generally have been responsible for the development of the farm. Though much has still to be done, the farm has so far been developed into 16 paddocks, on most of which good pastures have been established. The aim has been to develop a unit on which trainees can gain special knowledge of the work and management of a fat lamb farm. Each year winter feed crops such as turnip, swedes, and chou moellier are grown and a lucerne stand is harvested for hay.

The flock of 850 ewes is treated as a separate flock and all work such as drafting, weaning, feeding, crutching, foot-rotting, and culling of this flock is done by trainees. On the fat lamb farm trainees learn the work of dealing with a mob of ewes at lambing, the practice being to allocate a paddock of lambing ewes to a trainee for his care during the day. If lambing difficulties such as difficult births, mis-mothered lambs, and similar troubles occur, the trainee attends to these matters under the supervision of the shepherd in charge of the farm. A foot-rot bath is built into the sheep yards and trainees do all drafting, inspections of lame sheep, and foot-rot treatments.

In the woolshed on this farm a portable, two-stand, petrol-driven shearing plant is used and crutching and dagging are undertaken by trainees. Control of weeds such as thistles, lupin, gorse, and rushes in pastures is practised, hand-powered spray and mechanical methods being used. Fencing is an important feature of training on this farm

HEADING PHOTOGRAPH: Buildings at Flock House. On the left is the new dormitory building, consisting of two large dormitories, ablutions block, and housemaster's quarters. This building houses 32 trainees, who are responsible for daily cleaning of the rooms and making their own beds under the supervision of the housemaster. The central building includes the trainees' dining room (see illustration on page 320), kitchen, servery, storeroom, butcher's shop, and domestic quarters as well as a visitors' dining room. This building and its staff are under the control of the matron. The building on the right of this group is the old hostel building which, containing the reading room, two dormitories, and offices, is the main hostel building. Behind this building but not in the picture is the main hall, in which lectures, debates, and dances and other functions are held.

PRACTICAL TRAINING AT FLOCK HOUSE



Upper left—Trainees, working under instruction, erect and maintain farm buildings. Upper right—Trainees are employed on the responsible task of preparing the soil and sowing crops. Middle left—Four of the six shearing stands are under the control of an experienced shearer who teaches trainees to shear. Middle right—Fencing instruction. Lower left—Cutting down a carcass of beef. Trainees do all the work in preparing meat for hostel use. Lower right—One hundred grade Jersey cows are milked. Provision is made to teach hand milking as well as machine milking.

The fat lamb farm. The woolshed, sheep yards, and fences were erected by trainees working under supervision.

and trainees are taught to maintain present fences and erect new subdivision fences with gates.

Dairy Farm

One hundred and thirty acres of some of the heavier land at Flock House is farmed as a dairy unit with piggery. A central lane gives access to 16 paddocks. A herd of 100 grade Jerseys is milked and average butterfat production is over 320lb. per cow. Each year about 40 calves are reared and of these 18 to 20 are kept as replacements for the herd and the remainder are sold later as in-calf heifers. For winter feed 3000 bales of hay and silage are made. Extensive use is made of the electric fence for pasture management and feed conservation, and grass harrowing, liquid manuring, and topdressing of pastures form an interesting part of the work on the farm.

An up-to-date 6-cow milking machine is used, but there are 14 bails in the shed to provide for instruction in hand milking. Cream is supplied daily to the Rangitikei Co-operative Dairy Company's factory, Bulls. Emphasis is placed on thorough shed and plant cleanliness and quiet handling of cows in the shed and about the farm.

In the piggery 10 purebred Berkshire sows, which show an average of 16 piglets per sow annually, are maintained. Pig management along up-to-date lines includes regular weighing of pigs, which helps to instruct trainees in feeding and growth rates. Sugar beet is grown for pig fattening and winter feed and as a supplement to skimmed milk. The total number of pigs ranges between 65 and 100 at various periods of the year and pigs are sold as baconers or porkers.

Left—Docking. Trainees receive special instruction in lambing, docking, dipping, and shearing. Right—Trainees drafting ewes and lambs and assisting a fat lamb buyer.

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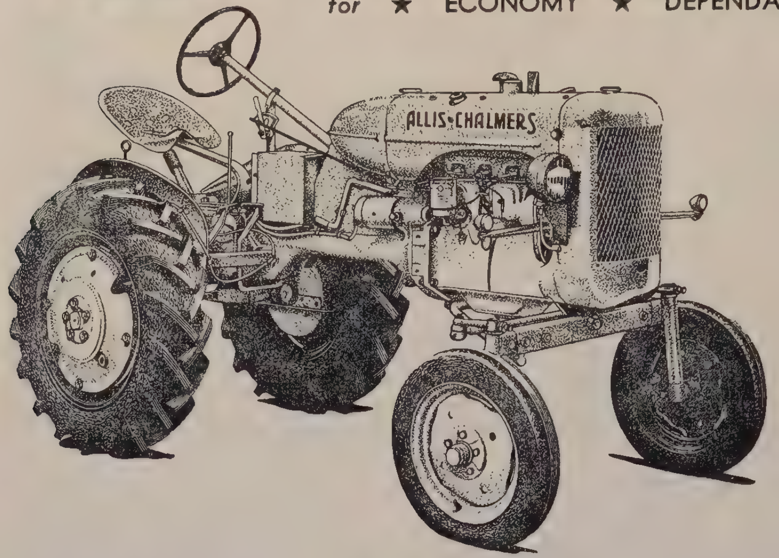

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Sheep and Cattle Station

An area of light sand country is farmed as a sheep and cattle station. The main ewe flock runs there and the beef cattle are reared on this area until ready for fattening. On the sheep and cattle station trainees receive instruction in shepherding and gain experience in handling station cattle. Winter feed is also grown on this land and the production and feeding of it, together with break fencing, general fencing maintenance and repairs, and shepherding form the bulk of the training.

Shepherding

Shepherding is a feature of the training and 14 saddle horses are kept for trainees riding about the farm on this work. Instruction is given to all trainees on handling and riding of horses. Shepherding includes riding "beats" and daily inspection of stock, attending to water requirements of stock, moving stock to fresh pasture, and special training at lambing, docking, dipping, and shearing.

Trainees have to help with the drafting of stock at shearing and other times when it is necessary to yard stock. Marking lambs and branding run cattle are work which trainees perform and have demonstrated to them.

Shearing and Crutching

During 1952-53 shearing season over 13,500 sheep and lambs were shorn in the main station woolshed and nearly 300 bales of wool were sent to the sales. Throughout shearing trainees gain experience at shepherding, drafting, shed work, and shearing. Four of the six shearing stands are under the control of an experienced shearer who teaches trainees. The system adopted is to teach a trainee the correct methods of catching and holding a sheep as well as how to handle and use the shearing handpiece.

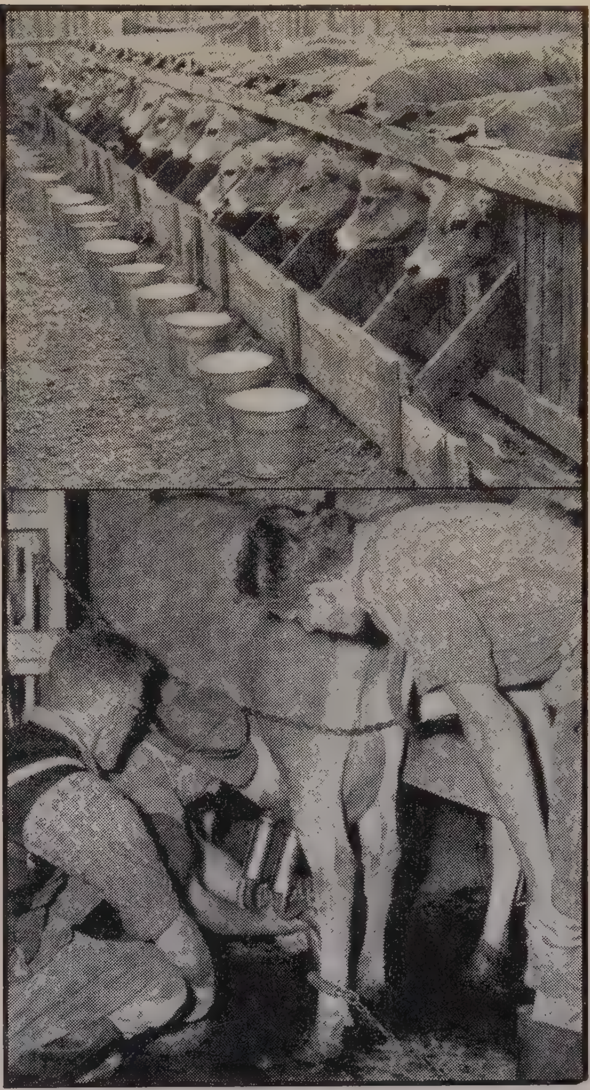
All shed work from the time sheep are shorn until bales are dispatched is performed by trainees, working under experienced instructors. It includes picking up, throwing fleeces on the wool table, skirting and rolling fleeces, woolclassing, and pressing wool. Instruction is also given on the care and grinding of shearing combs and cutters. Each season trainees compete in their own shearing competitions, which are conducted on recognised lines.

Cropping and Cultivation

Wheat, oats, barley, and grass seed are grown in addition to considerable areas of rape, kale, turnips, swedes, chou moellier, and sugar beet for winter and fattening feed. Including the area cropped and that prepared for pasture between 300 and 400 acres are cultivated each year. Portion of the area for winter feed crops is sand country that is being developed. Grain crops are usually grown on the heavier, river flat areas.

Modern methods of cropping and cultivation are employed and for cropping and development 7 tractors and 13 draught horses are used. Trainees are instructed in the care and handling of tractors and are instructed and employed on preparing ground and sowing crops. Horses are kept for cultivation and general farm work. Under the supervision of an experienced teamster trainees are instructed to handle, harness, and drive horses and to operate all farm horse-drawn implements, including the dray and the plough.

Such crops as wheat, oats, and barley are harvested for grain and with the large amount of hay saved each year



Above: Upper—Forty calves are reared each year and trainees learn to handle and care for these young stock. Lower—Trainees learning the correct method of placing milking machine teat cups on a cow. Below: Left—Baling hay. About 12,000 bales are made annually. Trainees gain valuable experience in harvesting and haymaking. Right—Building a stack of baled hay. Several thousand bales are used each winter on the sheep and cattle station.

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MR. R. E. S. PROWSE,
Graspan, Deniliquin, N.S.W.

"I have used your instrument in marking lambs in bitterly cold weather and wish to state losses were cut to 1/6th of 1% which you will admit is satisfactory and owing to this the instrument has paid for itself twice over already. Naturally I have reached the conclusion it is the best method yet devised."

MR. J. TOOLE,
Kiola, Peel Road, Kelso, N.S.W.

"I have been using the Elastrator for 4 years and I have found it to be a great success. In that time I have marked over 5000 lambs. I have not lost one from shock. Last year I proved to my neighbours that the Elastrator could be used in snowy weather without any ill effect to the lambs. I have marked lambs for at least 10 neighbours and they have all gone on to the Elastrator."

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trainees gain valuable harvesting and haymaking experience. Regular instruction is given in tractor and farm machinery safety.

Carpentry and other Trades

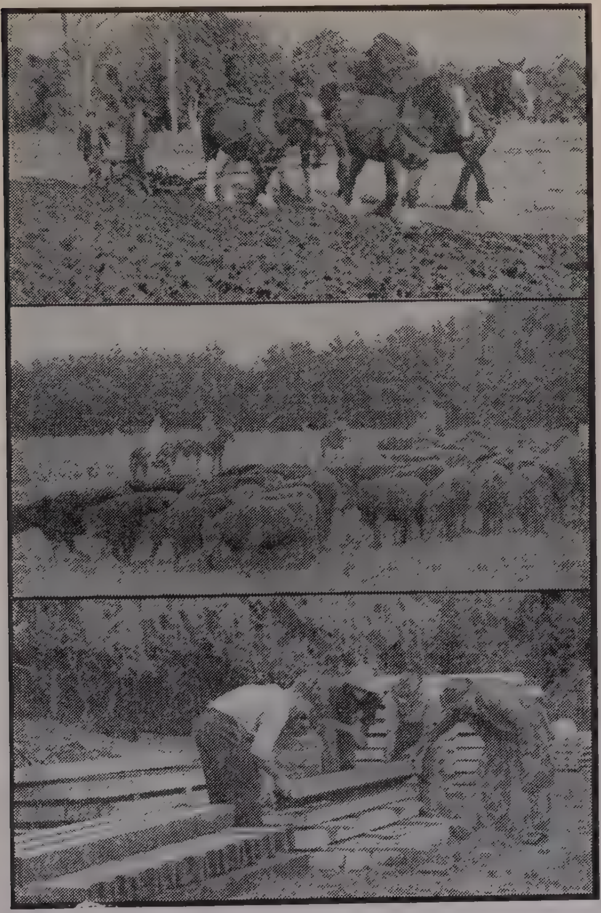
Trainees work with both the carpenter and the tradesman. Such projects as repairs to buildings and erection of new farm buildings are carried out, gates and hurdles are made, and trainees can learn much of plumbing, painting, water reticulation, and concrete work. Concrete fence posts and building blocks are made and all this work is performed by trainees working under supervision. The slaughterhouse and the swimming baths were both built by trainees.

Butchery

Each week sheep, cattle, or pigs are killed for hostel and staff meat. Using modern methods and working under supervision trainees perform this work, which includes dressing of carcasses and care of skins and hides. Emphasis is placed on cleanliness in handling meat and correct disposal and use of offal. When the meat has been thoroughly cooled it is removed to the butcher's shop, where trainees are taught the various cuts.

Poultry, Garden, and Orchard

About 200 fowls are kept and each year 100 chicks are reared in an electric brooder for flock replacements. Trainees working in this department learn the care and feeding of poultry. Eggs are used in the hostel and the surplus is sold.



Upper—Trainees learn to handle, harness, and drive horses and to operate all farm horse-drawn implements. Middle—Trainees receive instruction in shepherding and droving and gain experience in handling beef cattle. Lower—Trainees receiving instruction in making concrete posts.

Above—Working under experienced instructors, trainees learn to skirt and roll fleeces, class wool, and press it. Below—A field demonstration; trainees receiving instruction in the adjustment and use of a tractor-drawn topdresser.

There are approximately 3 acres in orchard and vegetable garden and here trainees receive instruction in the production of fruit and vegetables, which are supplied to the hostel and staff. A large area surrounding the main hostel buildings laid out in lawn, shrubs, and flower beds is kept trim by the trainees, who work under the supervision of an experienced gardener.

Lectures, Demonstrations, and Y.F.C.

Though the Flock House course teaches trainees the practical work of farming mainly, some consideration is given to the theoretical side of agriculture. Each week instructors give lectures on work with which trainees will be in contact. The lectures are of an elementary nature and considerable use is made of educational films and lantern slides. Besides the agricultural lectures talks are given on other subjects of topical or general interest.

Demonstrations of particular work on the property are a feature of training, and trainees as a group attend these demonstrations, which are conducted weekly. Demonstration tours are arranged, trainees being taken to interesting

Upper—Inspecting shearing competition winner's trophy. Middle—Trainees enjoying a meal. All meals are supervised by the housemaster. Lower—Swimming instruction. Ample recreational facilities are available, including tennis, football, golf, boxing, and athletics.

and up-to-date farms in surrounding districts and to freezing works, wool stores, etc., and public field days such as ploughing matches.

All trainees become members of the Flock House Young Farmers' Club, where they learn and practise meeting procedure and hold various offices. Visiting speakers are invited to club meetings and members take part in debates and public-speaking classes. Trainees operate the club under the supervision of an instructor.

Accommodation

The main hostel is set in spacious grounds and the attractive buildings are situated among shrubs and well-kept lawns. The main accommodation buildings are shown in the illustration on page 313.

Other buildings include a large woolshed, tractor houses, stables, and the usual store houses found on farms.

Recreation

Facilities are provided near the hostel for winter and summer sports. The swimming bath is equipped with diving board, and tennis, volley ball, and cricket are all played on grass. A 9-hole golf course is available to both trainees (for whom clubs are provided) and staff. Swimming instruction is given periodically and swimming and athletic sports are held regularly. Games are arranged with outside schools and clubs and a football team plays in the Rangitikei Rugby Union competitions. During winter evenings there are boxing and various indoor games. The country library service maintains a library and agricultural literature such as the "Journal" and Department of Agriculture bulletins is available.

Trophies

Both with instructional work and sport a competitive interest is encouraged. Trophies are available for competition within the various departments of work and are awarded for endeavour and ability. At the end of each course certificates are awarded to those who have made satisfactory progress, and those who have displayed special endeavour or ability receive a merit certificate.

Any New Zealand youth between 15 and 18 years old who is keen on agriculture and has the necessary medical and character qualifications may become a trainee at Flock House Farm of Instruction. Applications for entry should be made to:—

The Director,
Extension Division,
Department of Agriculture,
P.O. Box 2298,
WELLINGTON, C1.

Staff and Training Course

Flock House is under the control of the superintendent, who is assisted by qualified instructors and others selected for their experience in their own departments of the work on the property. When off duty trainees are under the supervision of a housemaster and the domestic arrangements are controlled by the matron, who is also responsible for the health of trainees.

Training is continuous and courses are of 12 months with two intakes of trainees each year, at the beginning of January and June. The course is available to any New Zealand youth between 15 and 18 years old who has passed the necessary medical examination, is of good character, and desires to follow the occupation of farming. There is no entrance fee.

Potato Variety Trials

By P. B. LYNCH, Crop Experimentalist, Department of Agriculture, Wellington

FOR the past 5 years simple potato variety trials have been carried out by Instructors of the Extension Division of the Department of Agriculture in most districts of New Zealand. Practically all the varieties in the Department's certification scheme have been included in the 131 trials sown, but only 91 trials gave sufficiently complete information for this summary. From 15 to 21 trials are considered in each year and from 23 to 26 varieties were sown in each trial. The trials were primarily designed to assist field officers in the identification of potato varieties and as such were not planned to give a representative covering of potato-growing soils and districts. This should be taken into account when results are studied.

THE following varieties have been compared in all trials: Glen Ilam, Sebago, Dakota, Inverness Favourite, Arran Pilot, Arran Banner, Dunbar Standard, Majestic, Iron Duke, Epicure, Arran Chief, Katahdin, Aucklander Short Top, Aucklander Tall Top, Jersey Bennes, King Edward, Arran Consul, Cliff's Kidney, and Doon Early.

Glen Ilam, Sebago, and Dakota are consistently among the highest yielders both of table and total (table and seed) tubers. In the lowest-yielding group are Doon Early, Cliff's Kidney, Katahdin, Chippewa, and King Edward. Cliff's Kidney, however, has given high yields of seed potatoes, but these have not compensated for low yields of table size tubers.

Generally the varietal yields are in a similar order in the different districts and on different soil types. When the mean yield of all varieties is compared, however, Canterbury considerably outyields the rest of New Zealand, the lowest yields being in Auckland Province. The recent alluvial soil type grouping has also shown superiority in mean potato yields over other soils. (Recent soils are those whose materials have recently accumulated and which have therefore not been subject to prolonged leaching.)

On the basis of time taken to mature, the potato varieties were fairly consistently classified as follows:—

First early: Epicure and Doon Early.

Early: Cliff's Kidney, Katahdin, and Chippewa.

Mid-season: Jersey Bennes, Aucklander Short Top, Arran Consul, Arran Chief, Majestic, Arran Banner, Arran Pilot, King Edward, and Inverness Favourite.

Late: Aucklander Tall Top, Dunbar Standard, Sebago, Glen Ilam, Dakota, and Iron Duke.

The early groups thus include most of the low-yielding varieties and the late group those with high yields. Arran Banner is classed as mid-season. This variety is often sown as an early variety, as it can be dug before reaching full maturity, and this also applies to some other varieties classed as mid-season in this grouping.

Resistance to Late Blight

None of the varieties included in these trials can be truly considered resistant to late blight, but all have shown differing degrees of susceptibility. In 5 years of trial Sebago and Aucklander Tall Top have received high marks for blight resistance and Iron Duke has been nearly as good. (Sebago is susceptible to the disease blackleg, which may be severe in poorly drained areas.) Glen Ilam and Dakota are also recorded as fairly resistant to late blight. On the other hand King Edward, Arran Pilot, Epicure, Doon Early, Chippewa, and Jersey Bennes have been most frequently severely infected with the disease.

Commercial Possibilities

Instructors have assessed the commercial possibilities of varieties in these trials, with due regard to yield, disease resistance, tuber quality, and similar features, and have given high marks to Glen Ilam, Arran Banner, Sebago, Dakota, Inverness Favourite, Iron Duke, Aucklander Tall Top, and Aucklander Short Top. Aucklander Short Top (Sutton's Supreme) has never been a particularly high-yielding variety, but has good tuber shape and quality and seems to give a reasonable yield under a variety of different growing conditions.

Arran Banner, if dug as an early variety, is one of the highest-yielding in this group. Glen Ilam and Sebago are two newcomers which have proved outstanding in yield and quality. Dakota gives consistently good yields of large tubers, which, however, are red, often irregularly shaped, and have deep eyes.

Cooking quality is very much a matter of individual preference. Wide variations in individual tastes have been apparent in preferences stated for tubers produced in these trials. No effort was made to secure uniform cooking conditions, but a good cross-section of normal household cooking would be covered in the tests. Such tests have shown that for flavour Glen Ilam, Arran Consul, Sebago, Aucklander Short Top, Arran Chief, and Arran Banner have been preferred. On the other hand there have been many adverse reports of Jersey Bennes, Majestic, and Cliff's Kidney. These three are commonly used when immature and sufficient allowance may not have been made for this in the observations on cooking quality.

Potato observation trial, showing relative susceptibility to late blight. From left—Maori Chief (extreme left, label not in photograph) hardly attacked, Majestic, King Edward, Katahdin, and Jersey Bennes severely attacked, and Iron Duke also hardly attacked.

TRACTOR OPERATING COSTS

Rolling

Inter-row cultivation

Grubbing

Breaking in hill country

Data on tractor operating costs covering work with all types of tractors under varying conditions throughout New Zealand are being assembled by the Department of Agriculture. Seventy farmers are co-operating in supplying information, which is analysed and tabulated. The recording system is easy to operate and tractor operators have found the results both interesting and useful.

[Photographs by Sparrow Industrial Pictures Ltd. (top right and lower left), National Publicity Studios (middle left and lower right), and Green and Hahn Photography Ltd. (middle right).

Market gardening

Drilling

Survey of Tractor Operating Costs on Farms

By R. I. C. MACPHERSON, Investigating Officer, Department of Agriculture, Wellington

OF the many and varied improvements and changes which have taken place in agricultural management practices during the last 20 years one of the most spectacular has been the rapid increase in the number of agricultural tractors being used on New Zealand farms. In 1930 there were only 3891 agricultural tractors, in 1939 there were 9639, in 1952 there were 45,734, and today it is estimated that there are least 50,000 tractors working on New Zealand farms. Thus it has come about that tractors are now almost the sole means of farm motive power.

WITH present prices ranging from approximately £400 to over £2000, these machines are, however, an expensive item of farm equipment. For example, a £400 tractor on a 40-acre dairy farm represents a capital outlay of £10 per acre. It is therefore important that a farmer should know (a) what class of tractor is most suited to his needs, (b) how to get the most economic use out of his machine, and (c) what the operating costs for his type of machine are likely to be.

Apart from the obvious importance of this information to the farmer, accurate details of tractor operating costs are also important for use in cost of production survey work on farm products. In the past it has often been necessary to make arbitrary estimates to cover tractor costs for cost survey work.

The first step toward obtaining more accurate details on operating costs was taken during the 1947-48 season, when the economics section of the Department of Agriculture carried out a tractor survey in Canterbury Land District. This work was experimental and apart from the primary object of establishing operating costs, the survey was designed to give an over-all picture of the types of tractors in use for different farming programmes and the average number of hours they were working during a season; also it was designed to find out how much information on tractor running could be readily obtained.

The information used in the survey was collected from questionnaires on which details of one season's tractor operations and costs and details of the types of machines being used were entered. All tractor operators concerned in the investigation were most co-operative and little difficulty was encountered in obtaining the details asked for.

The Canterbury survey has provided very valuable information, which has been in constant use during the last 3 years. An analysis of the results obtained, however, has shown that though the method of investigation employed was the most satisfactory one for obtaining quick results, it was not possible to avoid using estimations for some items of cost. For example, charges for normal repairs and maintenance, which do not occur at easily predictable intervals, could not be properly established from a survey covering one season's operations, and also before overhead or capital costs (that is interest and depreciation) could be calculated it was necessary to know the economic life of the machine concerned. Thus estimations had to be made to cover these and other items such as the renewal of tyres or tracks, etc.

It was therefore decided that these limitations could be overcome only by a system of regular recording over a considerable period. It was argued that if a sufficient number of tractor owners throughout New Zealand were to take part in the scheme, before long a regular flow of accurate information would be available of types of tractors operating under more varied conditions than those surveyed in Canterbury.

Accordingly in 1950 a survey using the log-book method of recording was initiated. All farmers who wished to participate in the survey were supplied with two single-sheet forms, a block of monthly recording sheets, and a set of instructions indicating how the entries should be made.

On the first form the farmer is asked to give a full description of his tractor and to state the conditions under which it is operating; on the second form he is requested to give a description of the implements held for use with the tractor. When completed these forms are returned to the Department, where they are held for use in conjunction with the main recording sheets.

The farmer then makes daily entries on the monthly recording sheets of all work done and expenses incurred in running his tractor. The sheets are designed to give the following information:—

The time the tractor is operating and the jobs being done.

The time spent in tractor maintenance and repairs.

The quantities of fuel, oil, and grease consumed.

HEADING PHOTOGRAPH: Preparing the ground for winter feed, Grasmere Station, near Cass. National Publicity Studios photo.

The prices paid by the farmer for fuel, oil, and grease.

The costs of spare parts, replacements, or repairs done by outside firms.

Each month the recording sheets are forwarded to the Extension Division, where they are analysed and tabulated, so that at the end of 12 months an accurate record of costs and work done is available. A summary of these details is then drawn up and a copy of the information is forwarded to the tractor owner concerned.

Now that over 20 farmers have completed at least a year's recording it has been decided to publish examples of the annual summaries, one for a medium-sized track-laying tractor, one for a medium to heavy wheel tractor, and one for a light wheel tractor. The first two are typical of tractors used on arable farms, and the last is a machine commonly used on dairy farms. It is not possible to publish either the names of the owners or the makes of the tractors, but all three machines are well-known standard makes.

EXAMPLE 1 (Canterbury Farmer)

(Medium tracklayer of approximately 25 h.p.)

Work performed during 12 months ended 31/5/51

Item	Acres worked	Hours worked	Acres per hour
Ploughing	59	71	0.83
Discing	178	99	1.80
Grubbing	211	94	2.24
Drilling	79	27	2.93
Topdressing	224	69	3.25
Harrowing	134	20	6.70
Totals	885	380	

Total fuel oil consumption per hour was 1.83 gallons.

Actual cash expenditure during 12 months ended 31/5/51

	£	s.	d.
Petrol: 6 gallons at 2s. 2d.		13	0
3½ gallons at 2s. 5d.		8	5
Fuel oil: 545 gallons at 1s. 3¾d.	35	16	0
151½ gallons at 1s. 5d.	10	14	8
Oil: 65 pints	2	1	6
8 pints at 1s. 2d.		9	3
Grease: 25lb. at 1s. 2½d.	1	10	0
Maintenance: 22 hours at 3s. 10d. (est.)	4	4	4
Spare parts	7	2	1
Outside repairs		—	
Insurance and registration		—	
Total	£62	19	3

	£	s.	d.
Running cost per hour (£62 19s. 3d. ÷ 380)		3	4

Capital Costs

	£	s.	d.	£	s.	d.
Present value as at beginning of recording period				1516	0	0
Interest on present value at 4½ per cent.	68	4	5			
Depreciation 8⅓ per cent. on £1516	126	6	8			
Estimated total interest and depreciation				194	11	1
Estimated capital costs per hour					10	4
Estimated total costs per hour, running costs plus capital costs, during 1950-51					13	8

In this example the high estimated cost per hour is primarily due to the small number of hours worked, divided into the high capital costs of a new tractor.

EXAMPLE 2 (Southland agricultural and pastoral farmer)

(Medium to heavy wheel tractor, 7 years old, of approximately 25 h.p.)

Worked performed during 12 months

Item	Acres worked	Hours worked	Acres per hour
Ploughing: 2 F. digger	93.50	87.75	1.07
3 F. plain	196.25	147.75	1.33
Inter-row cultivation	65.25	49.00	1.33
Rolling	10.50	4.50	2.33
Drilling	203.00	86.25	2.35
Topdressing	99.00	41.50	2.38
Discing	270.25	106.50	2.54
Discing and harrowing	18.00	7.00	2.57
Grubbing	399.50	136.00	2.94
Harrowing	701.50	104.25	6.73
Potato planting		1.50	
Total cultivation work	2,056.75	772.00	
Reaping	15.00	10.00	1.50
Total harvest work	15.00	10.00	
Carting		12.50	
Total work	2,071.75	794.50	

Hours worked and loadings, with fuel consumption

Load	Hours worked	Fuel consumption per hour Kerosene gal.	Petrol gal.
Full	492	1.92	0.08
¾	266½	1.30	0.08
½	22	1.07	0.07
Not stated	14	0.80	0.14

Over-all fuel consumption was petrol 0.08 gallons per hour, kerosene 1.67 gallons per hour.

Cash expenditure during 12 months

	£	s.	d.	£	s.	d.
Petrol: 50 gallons at 2s. 2d.	5	8	4			
10 gallons at 2s. 5d.	1	4	2			
3 gallons at 2s. 6d.		7	6			
				7	0	0
Kerosene: 647¼ gallons at 1s. 9d.	56	12	8			
684 gallons at 2s.	68	8	0			
				125	0	8
Oil: 254 pints at 1s.				12	14	0
Grease: 6lb. at 1s.					6	0
Maintenance: 39 hours at 3s. 10d. (est.)				7	9	6
Spare parts and replacements				59	1	0
Outside repairs				11	5	6
Insurance and registration				4	14	6
Total				£227	11	2

	£	s.	d.
Running cost per hour (£227 11s. 2d. ÷ 794.5)		5	9

Capital Costs

	£	s.	d.	£	s.	d.
Present value as at beginning of recording period				394	0	0
Interest on present value at 4½ per cent.	17	14	7			
Depreciation 8⅓ per cent. on £608	50	9	3			
Estimated total interest and depreciation				68	3	10
Estimated capital costs per hour					1	8½
Estimated total costs per hour, running costs plus capital costs, during 1950-51					7	5½

EXAMPLE 3 (Waikato dairy and sheep farmer)

(Light wheel tractor, 1 year old, of approximately 15 h.p.)

Work performed during 12 months ended 31/8/51

Item	Acres worked	Hours worked	Acres per hour
Discing and harrowing	0.5	1.5	0.33
Liming and topdressing	121.5	69.75	1.74
Harrowing	123.5	35.75	3.45
Total cultivation work	245.5	107.0	
Sweeping and heaping	3.0	9.0	0.33
Mowing and sweeping	9.0	24.0	0.38
Sweeping	30.5	27.25	1.12
Mowing	73.5	53.0	1.39
Tedding	18.0	8.0	2.25
Raking	24.0	10.0	2.40
Total harvest work	158.0	131.25	
Cartage		149.75	
Belt work		10.5	
Total work	403.5	398.5	

Petrol consumption was 0.62 gallons per hour.

Cash expenditure during 12 months ended 31/8/51

	£	s.	d.	£	s.	d.
Petrol: 22¾ gallons at 2s. 1½d.	2	8	4			
104½ gallons at 2s. 2½d.	11	10	9			
51½ gallons at 2s. 6d.	6	8	9			
69 gallons at 2s. 6½d.	8	15	4			
				29	3	2
Oil: Engine 32 pints at 1s. 8d.	2	13	4			
12 pints at 1s. 6d.		18	0			
Other 36 pints at 1s. 7d.	2	17	0			
				6	8	4
Grease: 12lb. at 1s. 6d.					18	0
Maintenance: 6 hours at 3s. 10d. (est.)				1	3	0
Spare parts				1	1	6
Outside repairs				—		
Insurance				4	9	0
Registration					5	0
Total				£43	8	0

	£	s.	d.
Running cost per hour (£43 8s. ÷ 398.5)		2	2

Capital Costs

	£	s.	d.	£	s.	d.
Present value as at beginning of recording period				481	0	0
Interest on present value at 4½ per cent.	21	12	11			
Depreciation 6.7 per cent. on £489	32	15	3			
Estimated total interest and depreciation				54	8	2
Estimated capital costs per hour					2	9
Estimated total costs per hour, running costs plus capital costs, during 1950-51					4	11

Tractors at assembly plant awaiting dispersal in New Zealand.

The summaries give acreages and hours worked for each operation, plus working speed, as well as details of fuel and oil consumption, fuel consumption per hour, other operating costs, and a section on capital costs. Details of work performed and cash expenditure are based on data received on the monthly recording sheets. Capital costs are partly based on data provided by the tractor owner, but until information is available on the entire working life of tractors of various types the depreciation rate charged is purely arbitrary, and is based on an estimated working life of 12 years for medium to heavy farm tractors. This is probably too long for a tracklayer, but there is evidence from the survey that some small wheel tractors doing light work on dairy farms may have an active economic life of 15 years or more. To ensure that this section of the recording scheme is adequately covered no tractor is included in the survey unless its age, total hours worked, and past repairs and replacements, etc., are known.

The high capital cost for the tracklayer, example 1, is largely due to the small number of hours worked. Had the hours worked been doubled, the capital cost would have been 5s. 2d. per hour and the total running cost approximately 8s. 6d. per hour. Even so the total cost shown is probably a substantial saving compared with contract rates for this type of work.

[*Reuterphoto photo.*

Tractors for export lined up on the Avonmouth (Gloucestershire) waterfront.

The annual running costs as detailed on the summaries are unlikely to be the same as the average costs during a tractor's entire life. For example new tractors will normally have little or no repair and replacement expenditure and will have lower than average annual running costs, and tractors which have had a large amount of major repair and replacement work done during the recording year will have higher than average running costs.

When the survey has been in operation for a sufficient time it is intended to supply tractor operators with annual and average running costs figures, but this is not possible until at least 2 years' recording has been completed. It can be readily seen that the longer the recording scheme continues the more typical the average cost figures will become for each tractor.

At present 70 farmers participate in the survey, 26 of whom have completed 12 months' recording and have received their annual summary of operating costs. From comments so far received the recording system is easy to operate and tractor operators have found the results both interesting and useful. However, it is hoped that more farmers will join in the survey in order that all types of tractors working under varying conditions throughout New Zealand will be properly represented. Tracklaying tractors are one of the main types which are not yet properly represented in the survey.

For those farmers who wish to join the recording scheme full details can be obtained from local officers of the Department, or from the Extension Division, Department of Agriculture, Box 2298, Wellington.

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Meat Inspection Service

By J. H. THORNTON, Supervising Meat Inspector,
Tomoana Freezing Works, Hawkes Bay

MEAT inspection in New Zealand is one of the most important public services. Though it has had very little publicity, it has been in existence for over 50 years and today plays a major part in one of the country's largest primary industries, the production of meat for export.

THE term meat inspection in its broadest sense includes not only the ante-mortem and post-mortem inspection of meat intended for human consumption, but embraces the veterinary supervision of public and private slaughterhouses, meat markets, meat canning works, bacon factories, etc. The chief purpose of an efficient meat inspection service is, of course, to protect man from the dangers to which he would be exposed as a result of eating meat if inspection was non-existent or inadequate.

In its infancy meat inspection was carried out by a few qualified veterinarians, mostly in abattoirs, where meat was killed mainly for consumption within New Zealand. As the meat-export industry grew so did the need for more meat inspectors. To meet this growing need laymen had to be taught by veterinarians so that they could assist in this most important work; thus over the years the meat inspection staff has grown from a small band in the last century to the several hundreds who are employed in the meat industry today. A scale of inspection fees charged on all stock killed spreads the cost over the industry and bears almost the whole expense of the scheme.

Today there is a meat inspector or staff of meat inspectors at every registered abattoir or meat-export slaughterhouse in New Zealand. The number ranges from one inspector at small abattoirs to about 20 in the larger works. Where a number of inspectors are employed a supervising meat inspector is in charge of the work, and he is directly responsible to the veterinarian in charge of that particular district.

Training of Meat Inspectors

To become a qualified meat inspector the individual must spend a minimum of 2 years as an assistant, and during that period is required to study meat inspection from recognised text-books, as well as the Meat Act and Regulations. At various times during his training he is given examinations and at the end of 2 years he is required to sit the examination set down in the Meat Act. This consists of a fairly comprehensive written paper which contains questions on elementary veterinary science, parasitology, sanitation, and hygiene. In addition the candidate has to undergo an oral examination in the slaughtering place. All the examiners are veterinary surgeons.

Examining lymph glands in the abdomen, a common site for tuberculosis.

[*National Publicity Studios photo.*

Examining carcasses of mutton.

Inspection Procedure

The Meat Act calls for the ante- and post-mortem inspection of all animals slaughtered in a registered slaughterhouse. The ante-mortem inspection is usually carried out in the yards and pens. By ante-mortem inspection it is possible to find animals suffering from obvious diseases such as arthritis, facial eczema, etc., in sheep, and actinomycosis and tuberculosis among other things in cattle. With the finding of any of these conditions it is possible to co-ordinate ante- and post-mortem inspection.

Post-mortem inspection is a very much bigger job than is ante-mortem, as it calls for the handling and examination of every carcass individually and a thorough knowledge of anatomy and disease conditions.

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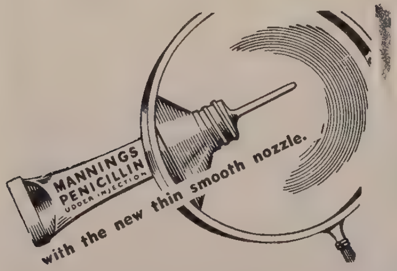
Time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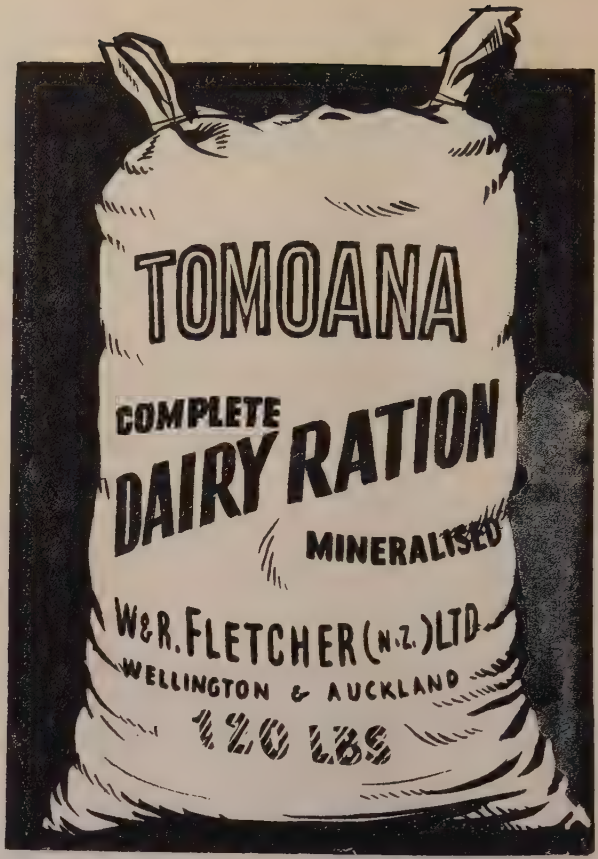

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Carcasses and viscera (internal organs) are examined by eye, by palpation (feeling with the fingers), and by incisions with a knife into the lymphatic glands. As these last are most important to meat inspection, a short description of them follows.

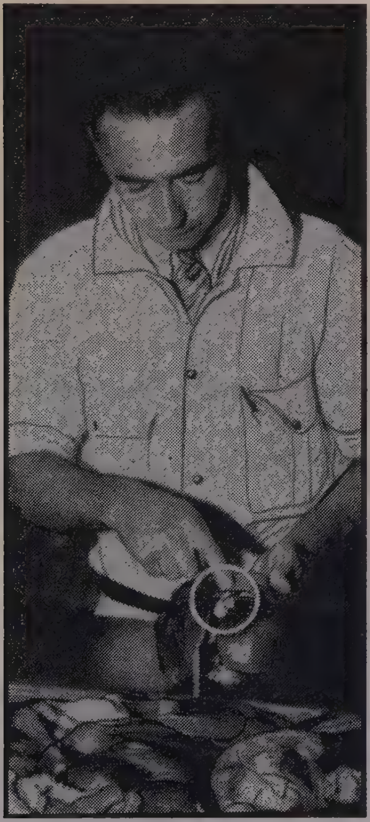
Lymphatic Glands

Blood is pumped to the body by the action of the heart and returns to the heart by the veins. A substantial part of the liquid portion of the blood, the lymph, remains in the tissues and drains back to the main veins by what is known as the lymphatic system. At intervals along this system the lymphatic glands occur. These are round or oval bodies up to 2 or 3in. long in large animals. One of the principal functions of the lymphatic glands is to act as filters to remove impurities including harmful bacteria which may have passed the protective barriers in the blood. Tuberculosis in cattle and "CLA", "Lympho", or *Caseous lymphadinitis* in sheep and lambs are invariably located first in the lymph glands. Meat inspection takes advantage of this fact and the glands are either felt (palpated) with the fingers or incised with a knife to ascertain if any abnormality is present.

Sheep and Lambs

The inspection of sheep and lambs is done mainly by palpation; the inspector feels most of the important glands in the carcass and through his training can tell immediately if a gland is abnormal. Should he find such a case—and there are many—he then incises the gland. If the inspector finds an affection, he examines other glands in the same way and on their condition decides the fate of the carcass, which may entail rejection (total condemnation).

First-grade beef.


Hydatid cyst (in circle) in liver. That shown is relatively small.

Cattle and Pigs

Inspection of cattle and pigs is much more detailed than inspection of sheep and lambs, as all the glands examined have not only to be incised but sliced up. The reason is that some tuberculosis lesions are very small and if the gland is not cut up, these small lesions could easily be missed. In addition to thorough examination of cattle and pig carcasses the viscera must be inspected.

Magnitude of Work

As some millions of carcasses are exported from New Zealand annually, meat inspection is a work of some magnitude, particularly as the work is seasonal. Apart from the New Zealand Meat Act and Regulations, standards are laid down by the British Ministry of Food and other purchasing organisations. The New Zealand Department of Agriculture is responsible for maintaining the very high standards required for meat killed for export.

Numerous people confuse the work of meat inspectors and the work of graders at a freezing works. Meat inspectors have nothing to do with the grading of meat for export. This is done by men specially trained in that work, the standard of grading being supervised by an officer of the New Zealand Meat Producers Board. Meat inspectors in abattoirs and some freezing works are responsible for the grading of meat for consumption within New Zealand. Here again the Department of Agriculture does not set the standards, this being done by a committee set up by the Standards Institute.

To ensure that only disease-free meat reaches the public many carcasses have to be condemned, some partly—legs or quarters—and some have to be trimmed and rejected for export. As the overseas market is New Zealand's shop window, it would not be policy to ship carcasses which have had to be trimmed, etc. The New Zealand product has a very good reputation overseas and it would be folly to do anything to jeopardise it.

A meat inspector's job is to save meat as well as to condemn it. That may appear paradoxical, but a meat inspector does his best to salvage as much meat as he can from damaged carcasses; that is, from carcasses which have broken limbs, bruising, or local lesions of certain diseases, and from carcasses that have been badly dressed.

The salvaged meat is sold for local consumption, provided, of course, that the salvaged parts are safe for human consumption; hence the rejects one hears about at a freezing works.

Assistance to Farmer

The meat inspector's work can be and very often is a great help to the farmer in that in many cases where an abnormal incidence of any disease or condition is found the inspector will notify the veterinarian, who can then call on the farmer and give expert advice on the particular trouble. Much good work of this kind has been done, and with the co-operation of the farmer much more will be done, because after all it is for the benefit of the industry as a whole.

Again many farmers who are endeavouring to reduce or eradicate hydatids on their properties will ask the meat inspector to conduct a survey of the livers of the animals at time of slaughter. This the inspector has been pleased to do and has advised the farmer of the result. Unfortunately the number of farmers who are making an earnest endeavour to eradicate hydatids is very small. The results from some of the surveys have been very encouraging, showing that in some lines the incidence is as low as 2 per cent., the usual incidence of hydatids in sheep and lambs being approximately 50 per cent.

When the Department of Agriculture undertakes a major survey of any particular disease or condition affecting stock the meat inspector often plays a big part, it being his job to collect the appropriate glands and organs and forward them to the veterinary laboratory at Wallaceville. All these surveys are made with one object: to assist the farmer. When the veterinarian conducts a tuberculosis test on dairy herds and the reactors are sent to the nearest works for slaughter it is the duty of the meat inspector to conduct a detailed post-mortem examination and to furnish the veterinarian with a report on each carcass.

The meat inspector has to deal with diseases other than those in carcasses. In one afternoon in one works recently 5 baconer pigs were condemned because of the neglect of a farmer. The animals were affected with huge necrotic ulcers. Had the pigs received proper care when the ulcers were in the incipient stages the infection would have cleared up and about 800lb. of pig meat would have gone on to the market instead of being condemned.

Causes of Condemnation

The meat inspector notices many instances of neglect by the farmer, particularly with pigs; with these it may be bruising, blemishes caused by kicking, or wounds caused by sticks—in one case a pitchfork—all of which necessitate the rejection or condemnation of the carcass for export, which is an economic loss to New Zealand. Bad handling of lambs, particularly wool pull and careless loading into trucks, which cause many bruises and broken limbs, also results in many rejections. Many farmers send in sheep and lambs whose hindquarters are very dirty, so much so that the slaughterman cannot possibly turn out a clean carcass, which means that on inspection the inspector has no alternative but to reject it.

Although the meat inspector is trained to recognise the usual diseases and parasites which affect stock in New Zealand, he has to keep a sharp look-out for anything which may in his opinion be unusual. Should he find anything of this nature, he immediately calls in the veterinarian, who may then seek the advice of the veterinary laboratory at Wallaceville. In this way it may be possible to detect an epidemic disease and so nip in the bud an outbreak which could be disastrous to the farming industry.

Tagging of Export Meat

The final operation in the processing of export meat is usually inspection and grading, when a tag is attached to each carcass. The tag contains a veterinary certificate, as prescribed by the Meat Act 1939, and the veterinarian's signature on one side and on the other the grade mark and the registered number of the meat-export slaughterhouse from which the meat is exported. This tag serves two purposes; it shows the origin of the meat and that it has been inspected and passed as fit for human consumption. At works where meat is canned a meat inspector or inspectors are stationed in that department, because inspectors have to see not only that meat is free from disease but that it is handled under hygienic conditions.

In addition to inspection duties the meat inspector is also responsible for ensuring that the whole of the premises where meat is processed is kept clean and hygienic. He has also to keep a watch on the handling of stock to see there is no cruelty.

Check by Purchasing Countries

Most purchasing countries have an inspection system whereby a check is made on meat from New Zealand. If any disease is found in a carcass, the tag which is attached at time of processing is removed and handed to the New Zealand veterinary officer stationed in London, together with details of the complaint. This officer returns the tag and details to the Department of Agriculture in New Zealand. This in turn is referred to the supervising meat inspector at the works concerned for a report, so it will be seen that a very close check is kept on the work of meat inspectors in New Zealand. This is very necessary to safeguard the high reputation which New Zealand meat has overseas.

At the end of each month the inspector is required to provide a detailed return of all diseases and conditions found during the month. This return has to be rendered to the head office of the Department of Agriculture, where the figures are tabulated, so giving a picture month by month of the incidence of disease throughout the Dominion.

Any farmer visiting his freezing works who wishes to know anything of the causes for the rejection or condemnation of his stock should contact the supervising meat inspector or, in his absence, any meat inspector, who will give all the help he can.

Meteorological Records for February

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	64.8	— 0.8	79.0	44.7	3.74	8	— 0.43	1.37	8	164.0
Auckland	160	65.6	— 1.1	76.9	51.8	1.65	9	— 2.26	0.77	8	140.0
Tauranga	10	64.1	— 0.9	77.0	36.4	2.51	10	— 1.22	0.80	8	193.5
Ruakura	131	61.6	— 1.7	79.7	37.5	1.13	7	— 1.95	0.36	18	154.6
Rotorua	969	61.2	— 1.7	76.0	33.2	3.27	10	— 0.48	1.16	11	164.3
Gisborne	12	63.3	— 2.3	79.9	43.5	1.40	13	— 1.65	0.36	4	178.5
New Plymouth ..	160	62.0	— 0.5	76.0	44.3	4.06	10	+ 0.08	1.42	18	154.0
Napier	5	64.2	— 1.2	85.9	44.2	1.52	10	— 1.16	0.77	11	165.8
Karioi	2125	57.1	— 0.5	78.0	35.0	2.62	15	— 1.43	0.60	18	
Wanganui	72	63.0	— 0.7	78.2	49.7	2.09	10	— 0.88	0.53	11	164.4
Palmerston North .	110	61.9	— 0.6	78.5	41.8	3.07	14	— 0.02	0.94	12	128.6
Waingawa	350	60.1	— 2.3	82.0	38.0	4.28	15	+ 1.47	2.40	12	145.3
Wellington	415	59.4	— 1.9	72.8	48.1	4.99	10	+ 1.71	2.17	12	140.3
Nelson	5	61.4	+ 0.2	77.4	41.0	5.31	10	+ 2.69	2.53	13	219.1
Blenheim	12	61.4	— 1.9	82.0	38.9	1.89	7	— 0.25	0.78	11	178.0
Hokitika	12	58.3	+ 0.2	72.2	40.2	7.11	11	— 0.62	1.60	7	180.7
Hanmer	1225	56.4	— 3.0	85.0	36.0	3.20	11	— 0.45	1.05	12	139.1
Christchurch ..	22	60.0	— 0.8	83.1	40.8	1.62	10	— 0.18	0.50	11	152.3
Ashburton	323	59.7	— 1.3	86.2	41.8	1.81	10	— 0.88	0.64	11	167.5
Timaru	56	59.7	— 0.5	83.8	39.8	1.83	9	— 0.39	0.63	11	176.8
Alexandra	520	59.7	— 1.7	88.1	35.8	0.63	6	— 0.84	0.19	11	223.4
Taieri	80	55.5	— 2.2	84.4	37.7	1.43	11	— 0.88	0.40	28	145.0
Invercargill ..	0	54.6	— 1.6	79.8	33.3	2.14	19	— 1.21	0.63	25	145.6

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Vegetable Growing on Peat

By I. L. ELLIOTT, Assistant Superintendent, and J. ADAM, Research Officer,
Department of Agriculture Soil Research Station, Rukuhia

WITHIN a short radius of Hamilton there are some 20,000 acres of peat land varying in depth from 2 or 3ft. to 40ft. Much of this land is at present useless and produces nothing, and although much information has already been obtained at the Department of Agriculture Soil Research Station at Rukuhia about its development for grassland, it was realised that it is potentially useful for horticulture and accordingly the trials described in this article were started in the autumn of 1951 to demonstrate the suitability of different vegetable crops on raw peat. Sufficient work has been done already to prove that with proper treatment these areas of waste land can be made to produce good main-crop yields of most varieties of vegetables. The Rukuhia trials should form a useful basis from which to proceed.

ORGANIC soils for horticultural purposes have been used extensively all over the world for centuries. The fenlands in England, the muck soils in the United States, and the moorlands in Germany produce excellent yields from root and leafy crops.

Applications of fertilisers, crop rotation, and water control are no longer problems in those countries. Their concern is how to protect this valuable horticultural soil. Organic soils can be lost through rapid subsidence caused by frequent working and rapid oxidation of the soil. "Blowing" of the topsoil in the fenlands causes considerable damage to crops.

Although many of the properties of the Rukuhia peat have been described in previous articles in the "Journal", the following characteristics, all of which have a bearing on its suitability for development, need recapitulation:—

1. It is waterlogged in winter.
2. It is too dry in the surface layer in summer.
3. It is too acid.
4. It is low in available nitrogen, potash, phosphate, and calcium.
5. It lacks certain minor elements.

At first glance it would seem that such material would be totally unsuitable for horticulture, and it is until the peat has been modified in various ways. Waterlogging in winter and drying out in summer can be overcome by effective drainage and irrigation respectively. The working in of adequate quantities of lime decreases the acidity in the root zone, encourages the further decomposition of the peat, and supplies calcium for plant growth. Applications of fertilisers and other materials can be made to correct major and minor element deficiencies.

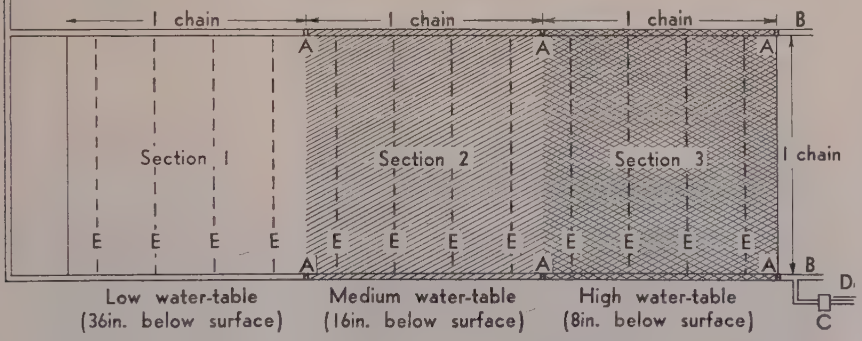
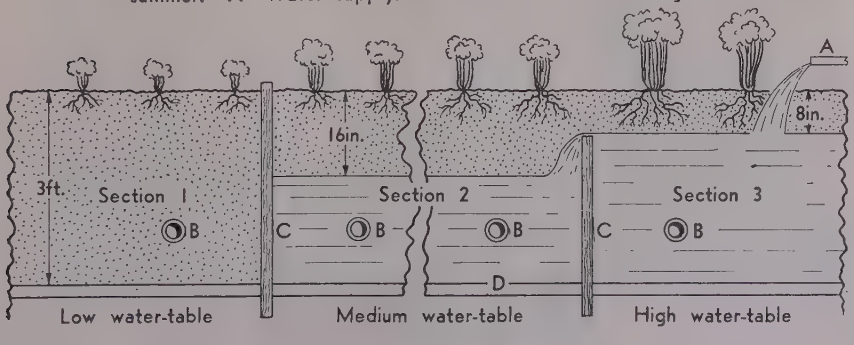


Fig. 1 (above)—Plan of vegetable area. A—Floodgates. B—Open drains 2ft. wide. C—Pump. D—Water supply. E—Tile drains. Fig. 2 (below)—Longitudinal cross-section through vegetable area, showing response of celery plants to different water levels. The water-table shown in section 1 as 3ft. varies according to rainfall in summer. A—Water supply. B—Tile drains. C—Floodgates.



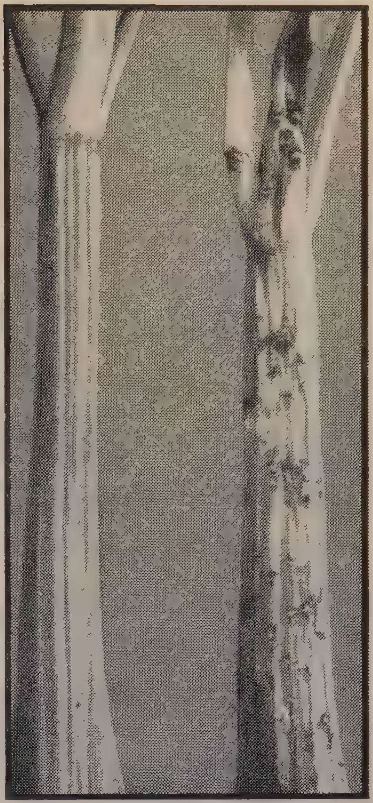


Fig. 3—Healthy (left) and boron-deficient (right) celery stems. Celery has been found an excellent indicator plant in the vegetable trials on peat.

Experimental Area

During the autumn and winter of 1950, 1/3 acre of peat 25ft. deep was cleared of manuka (*Leptospermum scoparium*), lime was applied, and the area was ploughed, disced, harrowed, and rolled. These operations were done with a tracklaying tractor with cleats 2ft. long attached to the tracks. Two side drains, each 3½ chains long and 1 chain apart, were dug by hand. These two open drains were joined by tile drains 4in. in diameter. The distance between tile drains was 16ft. 6in. The tiles were placed on wooden cradles 30in. below the surface to give them even support. Two floodgates were placed in each open drain 1 chain apart, dividing the area into three sections. Water was pumped in summer into two sections, the aim being to keep the water-table 8 and 16in. below the surface respectively. The third section did not receive any water applications during summer. During winter floodgates were removed so that the whole area could be drained properly. The layout of the area is shown in Figs. 1 and 2.

Fertiliser Requirements

In previous articles on peat development it has been stated that peat requires a heavy application of phosphatic and potassic fertilisers. The

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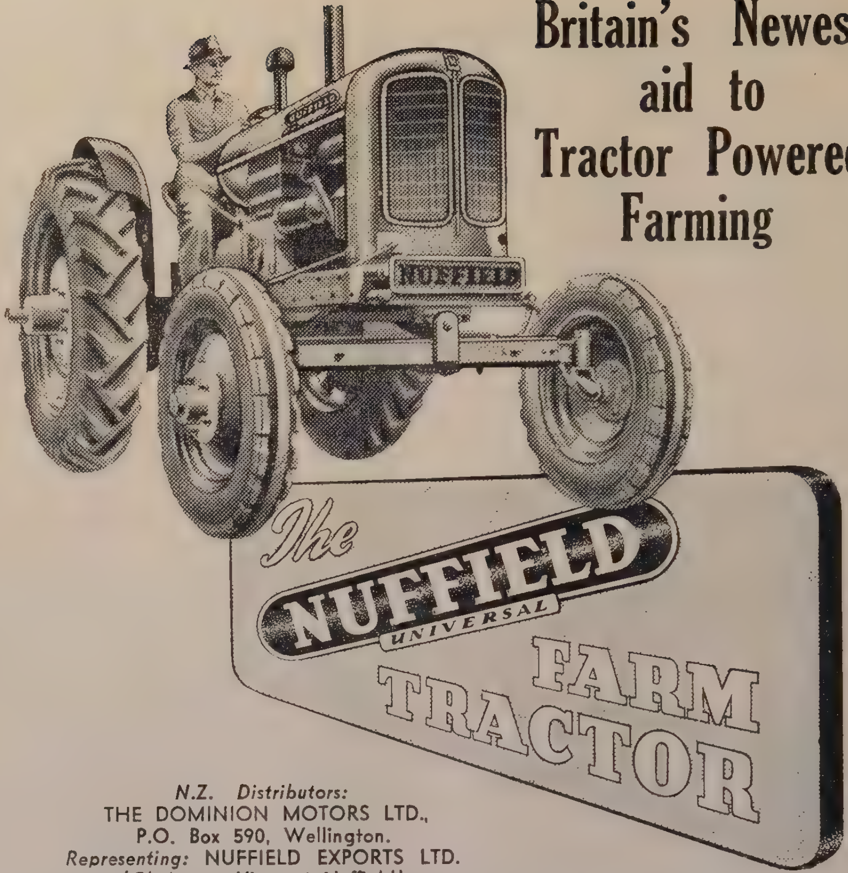

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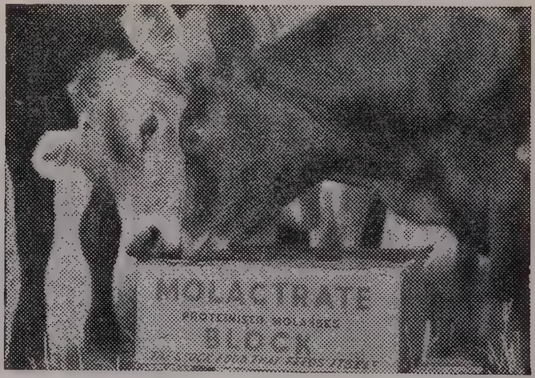

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lack of minerals in raw peat can be clearly illustrated by considering a 3in. layer of the area of 1 acre. Dried peat of that volume weighs approximately 50,000lb. with an ash content of 2500lb. The ash contains 1.7 per cent. of potash and 0.3 per cent. of phosphoric anhydride (P_2O_5) (1). In other words the total (not necessarily available) potash in this layer is 42.5lb. and phosphate 7.5lb. per acre. In later years when peat is drained and worked the volume weight and mineral content increase.

Although peat contains a high percentage of nitrogen (up to 2.5 per cent.), this nitrogen is not available for plant growth. To make it available lime has to be applied, and drainage is essential in winter.

Ten tons of lime per acre was ploughed in to a depth of 10in. This high application may seem excessive, but on raw peat it is a fundamental requirement. Once the soil is sweet to a considerable depth and provided it is not waterlogged, roots can go down and remain healthy. Another reason for the high lime application is increased nitrification, which leads to a cheap supply of nitrogen derived from the peat.

Fig. 5—Blueberry plant in full blossom. Imported from U.S.A., the plant was grown on very acid peat.

A very good indication of optimum acidity was obtained with celery plants grown with different lime applications. The following table gives an indication of lime applications in relation to pH, calcium, and growth:—

	No lime; too sour; no growth		5 tons of lime; not sweet enough; good growth		10 tons of lime; sweet; best growth		Too much lime: overlimed; stunted growth.	
Depth in.	pH	Calcium	pH	Calcium	pH	Calcium	pH	Calcium
0—2	3.6	nil	4.8	7	6	Over 10	6.8	Over 30
2—4	3.4	nil	4.4	6	5.5	Over 10	7.0	Over 30
4—6	3.4	nil	4.0	3	5.4	Over 10	6.7	Over 30

These results are in accordance with those obtained in the Everglades peat in U.S.A. (2). Although the problem there is different from that in New Zealand, as the Everglades are high in lime and the acidity has to be increased by the application of sulphur, the optimum pH for celery growth had to be adjusted to a value within the range of pH 5.4 to 5.7.

Good pasture growth can be achieved on all classes of peat land with the supply of the major elements nitrogen, phosphorus, potassium, and calcium, provided adequate moisture is present. In last year's trials with vegetables symptoms due to boron deficiency were observed in cabbages, corn, and celery. In a cabbage crop grown in spring hollow stems could be seen, maize showed white lines in the leaf, and celery had crosswise cracks on the surface of the stalk, making the tissue curl outward from these breaks (Fig. 3). An application of 20 to 40lb. of borax per acre prevented these symptoms in Auckland district, where boron deficiency in celery has been recognised since 1924 (3).

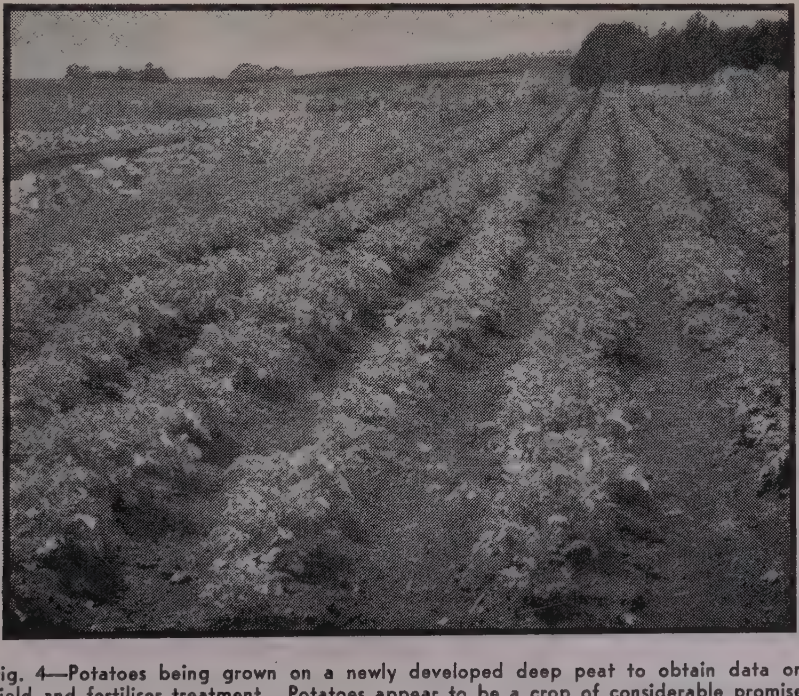

Fig. 4—Potatoes being grown on a newly developed deep peat to obtain data on yield and fertiliser treatment. Potatoes appear to be a crop of considerable promise on suitably developed peat.

This season a controlled experiment is being conducted to investigate the optimum amount of borax for various plants on peat and results will be published as soon as available.

Moisture Requirements

Peat in its raw, undrained state is too wet to support the growth of any vegetable crops. Consequently the first stage in development is the removal of the excess water by drainage.

Tile drains are the ideal remedy for most waterlogged soils, but probably too expensive for the commercial gardener who wishes to start on peat. Where sub-irrigation is to be applied mole drainage will do the job much cheaper and can be renewed each year where necessary. Where sub-irrigation is impossible because of buried timber spray irrigation can be used by pumping from open ditches or wells. Under these circumstances parallel open drains 3 to 4ft. deep are recommended. The space between the drains will depend on the nature of the peat. For very impermeable peat, drains 1 chain apart would be sufficient. If no water for any kind of irrigation is available, care should be taken not to overdrain the peat by spacing the drains too closely, as experience has shown that an excellent crop of spring cabbages and lettuces can be grown without irrigation. Even in summer satisfactory yields can be obtained by planting out seedlings. The most important point in this case is to work the soil well before planting out. Moist peat with a higher water-holding

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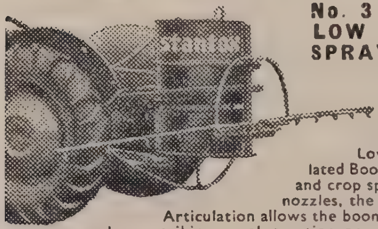

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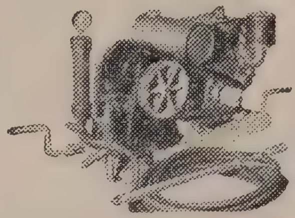

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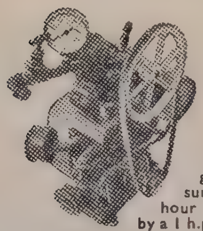

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Portable Unit for operating a spray boom or hand equipment. Easily transported and completely self-contained. Supplied with either 1″ pump (200 gallons per hour at 50 lbs. pressure) or ¾″ pump (170 gallons per hour at 50 lbs. pressure). Powered by a 1 h.p. air-cooled petrol engine.

Sections of Stantox Hand Equipment fit together "meccano" style and the set of six will make up into 10 different hand wands, including two and three-nozzle straight and T wands, and a three-nozzle blackberry spear.

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PHONE 64-111, AUCKLAND • FACTORY, EDINBURGH STREET, ONEHUNGA capacity is thus brought to the surface and young plants have a chance of surviving during dry weather.

In previous work on pastures on peat it has been shown that very little water is available for plant growth in the surface layer of peat in summer (4). On the other hand, 4in. below the surface plenty of available moisture was recorded after long dry spells. This means that once plant roots are established to a depth beyond 4in. and all manurial requirements supplied good returns without irrigation can be expected.

During the 1951-52 season the even rainfall distribution during summer was very favourable for vegetable growing in the Rukuhia district. Therefore no definite information was gained on the response due to different water levels in the three sections, with the exception of celery, which gave the highest yield in section 3. (See Fig. 2.)

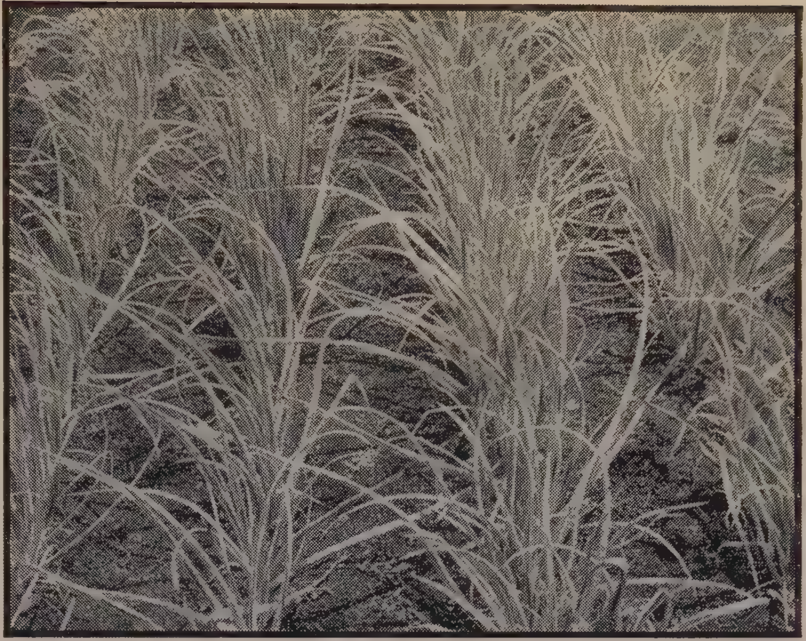

Fig. 7—Part of 4 rows of onions 3 chains long grown on the trial area. The aim of this trial is to determine the best fertiliser treatment and height of water-table for the crop.

Suitable Crops

The aim of the trial was to demonstrate that a large number of different vegetable crops can be grown satisfactorily on peat. Crops were supplied with fertilisers at the following rates per acre:—

Superphosphate: 10cwt.
Muriate of potash: 5cwt.
Sulphate of ammonia: 3cwt.

Tissue analyses* from cabbage plants have shown that the phosphorus and potassium levels were excessive; therefore, this year the rate of application will be cut down.

The following crops were grown successfully and would have brought good returns on an acreage basis: Cabbages, lettuces, strawberries, onions, and celery—all of excellent flavour. Silver beet, peas, and maize, which were also tried, did not yield to expectation. Controlled trials with different fertiliser applications to determine the most suitable have yet to be conducted. By cropping peat for several years conditions are changed, making it possible to extend the variety of crops.

In U.S.A. thousands of acres of raw peat are used for growing blueberries and cranberries. Both berries were imported from America and tried on Rukuhia peat. The blueberries made prolific growth during the first two seasons, but unfortunately each autumn all the fruit dropped off just before harvesting. Investigations are under way to study the cause of this abnormality. Once this problem is solved blueberries could be grown by the public. Cranberry plants did not thrive on Rukuhia peat, producing very few berries. Weed control is very difficult because of the creeping habit of cranberry plants. A blueberry plant in full blossom is shown in Fig. 5.

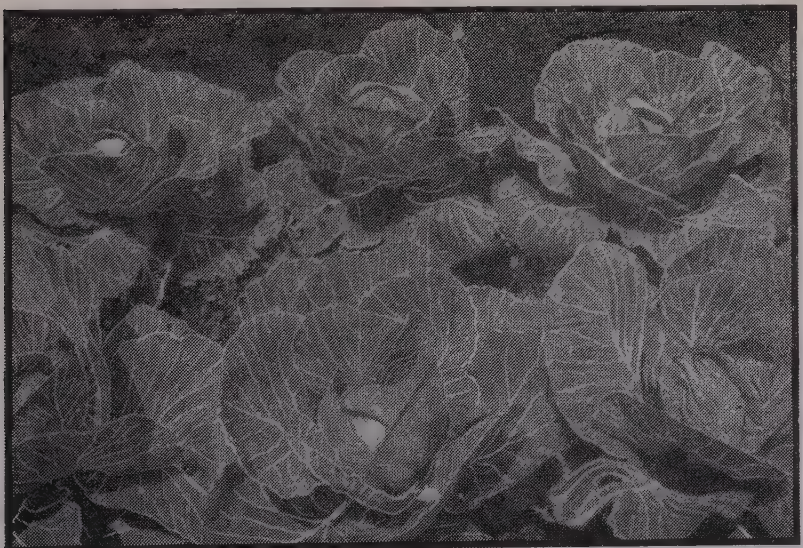

Fig. 6—Cabbage variety Succession on deep peat. Planted on 10 September, this crop was harvested from 7 December to 20 December 1951. The crop was excellently flavoured and brought good prices.

Advantages of Peat for Vegetables

For crop production peat has several advantages over normal mineral soils. It can be worked all the year round, a very important point in vegetable growing, and shortly after heavy rainfall cultivation can be carried on without the peat sticking to implements. On consolidated peat where the crust is about 2ft. thick wheel tractors can be used without danger of their getting bogged. On Rukuhia raw peat a tracklaying tractor with suitable extensions would be needed for cultivation.

Another advantage of peat is that it can be kept free of weeds without much mechanical effort.

As peat consists of a high percentage of organic matter, no organic fertilisers need be used. Once experience has shown the optimum levels of phosphate, potash, and nitrogen required these fertilisers can be applied continuously without depleting the soil of its organic matter or destroying its structure.

As peat does not stick very firmly to root crops, it is easily removed by washing. Clean vegetables are preferred by the public and fetch higher prices.

In Hamilton, as in many other cities which are expanding at a great rate,

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* Analyses by K. J. McNaught.

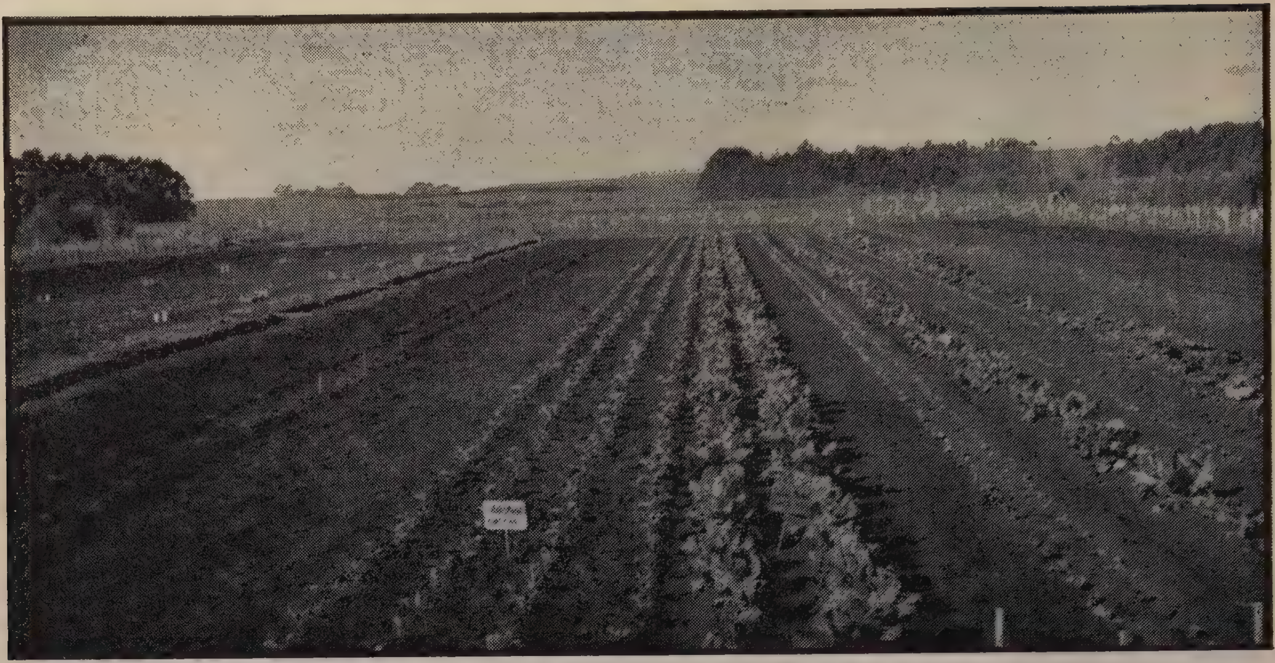

Fig. 8—General view of vegetable production experimental area on peat at Rukuhia.

some horticultural areas are being built over and market gardening must be carried on elsewhere. Although it is not suggested that there are not more suitable swamps for development for gardening than those of the Waikato basin, sufficient work has already been carried out to show quite conclusively that with proper treatment these areas of waste land can be made to produce good main-crop yields of most varieties of vegetables. Other areas of swamp land suitable for development for horticulture occur in the Kaitaia and Bay of Plenty districts. Should the time ever come when there is sufficient enterprise to develop these areas, the trials at Rukuhia should form a useful basis from which to proceed.

Apart from the potentialities of peat for vegetable production, there are very great possibilities for extensive use of peat for mixing with other soils, for growing special flowers, shrubs, and vegetables, and for use in potting composts. It may well be that in future the waste peat land of today will be regarded as an asset which should not be dissipated and destroyed by fire as some other assets have been in the past.

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1. "Development of Waikato and Hauraki Peat Soils", F. B. Thompson and I. L. Elliott, Seventh Pacific Science Congress, Auckland, February 1949.

2. "The Place of Soil and Tissue Testing in Evaluating Fertility Levels under Everglades Conditions", W. T. Forsee, jun., Soil Science Society of America proceedings 1950, vol. 15, page 297.

3. "Cracked Stem of Celery (*Apium graveolens* L.)", J. D. Atkinson, "The New Zealand Journal of Science and Technology", vol. 29, No. 5 (sec. A), page 261.

4. "Water Relationship in Peat Development", I. L. Elliott, F. B. Thompson, and J. Adam, Royal Society of New Zealand Science Congress, Christchurch, May 1951.

☆

Book Review

"Grasslands of New Zealand": E. Bruce Levy

EFFICIENCY and success in grassland farming depend on the farmer's knowing not only what to do and how to do it but why certain things have to be done. Basic to this is a knowledge of ecology; that is, the reaction of living things to their environment. The study of ecology does not begin and end with merely observing or measuring what happens; an essential feature is the necessity to endeavour to explain why certain changes take place as the result of modifications to the environment.

"Grasslands of New Zealand" is essentially an ecological study of New Zealand's grassland written by an author whose observations and deductions on the establishment and management of grassland have brought him world-wide recognition. What is perhaps more important is that these observations and deductions have influenced greatly and favourably the composition and management of pastures in New Zealand and overseas.

The following extract not only shows the complexity of factors involved in grassland farming but acts as a summary of the book's contents:—

> . . . grassland farming has become an exact science where all the inter-related factors of establishment, competition, light and shade, tolerance to defoliation, seasonal growth, soil fertility requirement and nutritive value, together with an adequate yield to satisfy the high producing animal, must be fully understood and observed by the grassland farmer.

The scope of the book is wide. The felling of the bush, which the pioneer farmer considered as "a menace to be removed as cheaply and as quickly as possible", and the sowing down with suitable seed mixtures are fully discussed. A section on soil conservation practices which are now being adopted deals adequately with a problem which arose from the felling and grassing of the bush land.

The author, though not a plant breeder, discusses much of the plant breeding work he directed for about 22 years. This work and the distribution of the seed through a scheme of seed certification have been of outstanding value to the users of grass and clover seed.

That the author is never satisfied with the present but is always looking to the future is exemplified by the statement that " . . . of the 18,000,000 acres of sown grassland in New Zealand more than 90 per cent. falls short of full development." Such a statement must give food for thought when one considers that the New Zealand farmer is regarded as a leader in world grassland farming.

Considerable emphasis is laid on the improvement of hill-country pastures by the correct use of improved strains of grasses and clovers, fertilisers, and livestock. The principles recommended are basically the same as those advocated in the author's "The Grasslands of New Zealand", published in 1923, but much of the detail in this latest book is different, because of advances in knowledge in the intervening 30 years. However, the two publications represent some of the best writing on temperate-climate grassland.

With 150 good illustrations in this book of over 300 pages the reader is given a good picture of the nature and management of New Zealand's grasslands. "Grasslands of New Zealand" can be recommended to all interested in grassland, whether farmer or research worker, teacher or pupil, salesman or seedsman. —*S.H.S.*

Government Printer. 26s. 6d.

Removal of Large Limbs of Fruit Trees and Treatment of Wounds

By N. B. CONGDON, Horticultural
Instructor, Department of Agriculture,
Auckland

DURING the life of a fruit tree one or more of its larger limbs may need to be removed because of the effects of disease or insect attack, overcrowding of limbs, inconvenience to spraying and cultivation machinery, or proximity to buildings or paths in home gardens. Fruit trees also have to be headed back before grafting. If a cut is made correctly and the wound is protected, there is little danger of disease organisms or pests entering and causing injury or death. Efficient removal of a limb is a simple matter if the correct method is adopted.

A BRANCH must be cut as close to the main limb as possible to facilitate rapid healing. If this is not done, the stub which remains does not callus over, but dies back to the main limb and thus provides an entry point for fungous diseases and harmful insects.

In cutting out a large, heavy limb it is advisable to make three cuts to achieve a close cut and avoid tearing the bark. The illustrations on this page show the correct method of removing a large limb.

Final cuts should be trimmed with a sharp knife and treated immediately with a suitable healing compound such as bituminous paint or crude petroleum jelly (petrolatum). Such materials help guard the wound against entry of fungous spores, bacteria, and harmful insects and also hasten the desired callus formation. The material used should be applied generously over the surface of the cut to seal off the wound completely from the air.

This treatment applies essentially to normally healthy tissue. If the wood cut out is diseased, it is necessary to disinfect the wound before applying the final wound dressing.

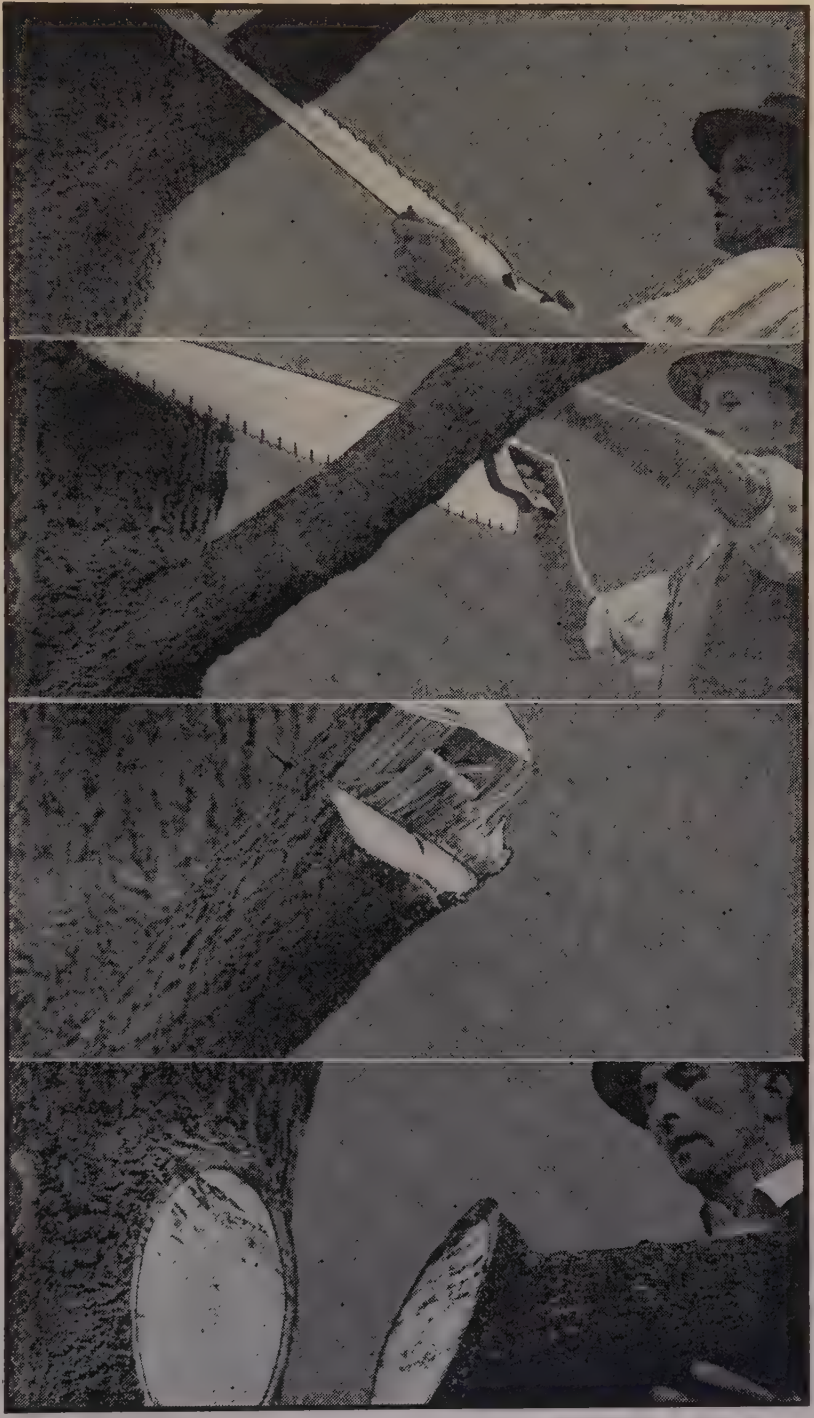
Disinfectant Materials

Three disinfectant materials are in general use for treating wounds on fruit trees. These are Bordeaux paste, acidulated mercuric chloride, and Restar disinfectant fluid.

Bordeaux paste is recommended for treatment of wounds on citrus trees after the cankered tissue caused by bark blotch (*Ascochyta corticola*) or collar rot (*Phytophthora* spp.) has been cut out.

Bordeaux paste is prepared by dissolving 1lb. of copper sulphate (bluestone) in ¾ gallon of water. Mix 2lb. of hydrated lime into another ¾ gallon of water and stir into a stiff paste. Then slowly add the copper sulphate solution. When mixed it has the consistency of treacle. Apply with a stiff brush. When the paste has dried, brush off surplus material and paint the wound with a bituminous paint.

Acidulated mercuric chloride is recommended as a general tree wound disinfectant. It can be obtained from chemists, or may be prepared by dissolving 1 gm. (1/28oz. approximately)

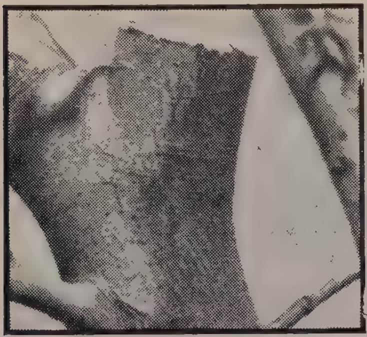


[*Green and Hahn Photography Ltd. photos.*

The correct way to remove a large limb. Top—Making the undercut. Upper middle—Making the cut above. Lower middle—The branch removed without tearing the bark. Bottom—The stump removed parallel with the line of the trunk.

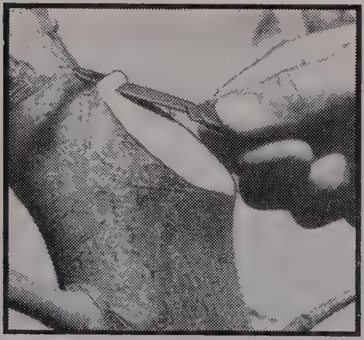
of mercuric chloride in 15 c.c. (½ fl. oz. approximately) of concentrated hydrochloric acid and adding the mixture to 1000 c.c. of water (36 fl. oz. approximately). Metals should not be allowed to come into contact with the solution. Mix it in a porcelain or enamelware container and store in a glass-stoppered bottle. The mixture is poisonous and should be so labelled.

Acidulated mercuric chloride is recommended for treating wounds after the cutting out of wood infected with diseases such as fireblight (*Erwinia amylovora*), silver leaf (*Stereum purpureum*), wood-rotting fungi (*Coriolus versicola*), European canker (*Nectria galligena*), black rot (*Physalospora cydoniae*), blister disease (*Coniothecium chomatosporum*), and diplodia canker (*Diplodia griffoni*). When wounds are dry they should be protected with bituminous paint or petrolatum.



[*Sparrow Industrial Pictures Ltd. photos.*

Above—Cut made too far from the main branch, leaving an ugly stub which will not heal over readily. Below—A branch should be removed by cutting it close to the main branch and trimming edges with a sharp knife.



Restar disinfectant fluid is recommended for treatment and disinfection of lesions on old limbs caused by bark blotch and shell bark (*Phomopsis citri*). It may be used with safety at full strength on old and mature wood. Two to four applications at monthly intervals may be necessary to control bad infections. Only infected areas and the immediately surrounding bark should be treated. If the whole trunk is covered as a preventive measure, healthy bark may be injured. During pruning operations it is a good policy to disinfect pruning tools with formalin to help prevent the spread of diseases from one tree to another.

Acid Equivalents of M.C.P., 2,4-D, and 2,4,5-T Hormone Weedkillers

By L. J. MATTHEWS, Weeds Research Officer, Department of Agriculture, Wellington

MANY users of hormone weedkilling preparations are confused by the strength of various preparations and do not know how to compare the strength of one preparation with that of another. At present there are nearly 50 proprietary brands of hormone weedkillers available. The natures and strengths of these preparations vary considerably, and inefficient results or severe damage can occur to crop and pasture species if the preparations are not applied at correct rates. This article explains how users of hormone weedkilling preparations can recognise the strength of preparations and compare the strength of one material with that of another.

THE active principle of hormone preparations is measured by the acid equivalent content. The term acid equivalent refers to the amount of parent hormone acid in a gallon of liquid weedkiller or is expressed as a percentage for dusts. All hormone weedkilling preparations are derived from one or more of three parent acids—M.C.P., 2,4-D, and 2,4,5-T. The strength of these hormone weedkilling preparations depends on the amount present of one or other of the three parent acids.

Parent Acids

From the parent acids a sodium salt, amine salts, and esters have been formulated and these compounds form the bases of commercial weedkillers. These formulated materials are all heavier than the parent acid. For example, the unit or molecular weight of 2,4,5-T acid is 255.5, that of the triethanolamine salt is 404.5, and that of the butyl ester is 311.5. For this reason the strength of all formulated preparations is given in terms of the parent acid.

The following table shows the relationship between molecular weights of 2,4,5-T acid and some of the compounds derived from it.

2,4,5-T ACID EQUIVALENTS

Preparation	Molecular weight	Percentage 2,4,5-T acid equivalent	lb. required to contain 100lb. 2,4,5-T acid
2,4,5-T acid ($C_8H_5O_3Cl_3$) ..	255.5	100	100
2,4,5-T triethanolamine salt ($C_{14}H_{20}O_6NCl_3$)	404.5	63	159
2,4,5-T butyl ester ($C_{12}H_{13}O_3Cl_3$) ..	311.5	83	122
2,4,5-T butoxy ethanol ester ($C_{12}H_{17}O_4Cl_3$) ..	355.5	71.9	139

Application

Efficient weed eradication with hormone preparations depends on four factors:—

1. Correct stage of growth of plant.
2. Correct hormone preparation.
3. Correct rate of active principle or acid equivalent applied per acre.
4. Complete foliage cover.

Most proprietary brands of hormone weedkilling preparations on sale in New Zealand state clearly on the label the acid equivalent content of the preparation; for example, ethyl ester of 2,4-D, 4lb. of 2,4-D acid per gallon. A normal rate of application for herbaceous weeds would be 1lb. acid equivalent per acre. A gallon of the product containing 4lb. of 2,4-D acid per gallon would therefore be sufficient for the control of 4 acres of herbaceous weeds, and 2 pints of the hormone preparation would be required per acre. Other products contain 2lb. acid equivalent per gallon of the ethyl ester of 2,4-D. These preparations would need to be applied at 4 pints per acre to give 1lb. acid equivalent per acre.

Rate per Acre

Users of hormone preparations should apply a set quantity of hormone weedkilling preparation to the acre, based on the acid equivalent content, in sufficient water to give a complete foliage cover. The amount of water needed per acre will depend on nozzle size, nozzle spacing, operating pressure, speed of travel, and type of plant to be sprayed. The making of a standard preparation of, say, 1 gallon of 2,4-D to 30 gallons of water for universal application is not recommended except for spot spraying of isolated weeds. For these, over-all applications are not required and a rate per acre cannot be worked out.

Gorse Control

In gorse control, for example, 1 gallon of 2,4,5-T in 100 gallons of water per acre applied with low-volume equipment has given the same control as 1 gallon of 2,4,5-T in 400 gallons of water per acre applied with high-volume equipment. The use of a standard mix of, say, 1 : 100 for universal application would lead to much wastage of hormone material.

Winter Show Dates

THE dates of winter shows to be held between the end of May and the beginning of July are as follows:—

*29 and 30 May; 1, 2, and 3 June—Otago A. and P. Coronation Show at Dunedin.

*26, 27, 28, 29, and 30 May; 1 and 2 June—Waikato Winter Show Association at Hamilton.

*10, 11, 12, and 13 June—Taranaki Metropolitan A. and P. at New Plymouth.

18, 19, and 20 June—Te Kuiti and District Winter Show at Te Kuiti.

30 June; 1, 2, 3, and 4 July—Whangarei A. and P. Winter Exhibition at Whangarei.

* The Department of Agriculture exhibit will be staged at this show.

FARMING IN NEW ZEALAND

Marlborough

THE early settlement of Marlborough began with the introduction of sheep flocks into the district. Since then various farming systems have developed, but sheep farming has remained of chief importance, and because of the high proportion of hill country in the district will probably continue to be so. However, other types of farm production are of considerable localised importance. Some conditions favour dairying, and in other parts the high incidence of sunshine and relatively low rainfall provide conditions suitable for the production of seeds of a quality second to none in the Dominion. In the first part of this article, which will be concluded in next month's issue, J. P. Beggs, Instructor in Agriculture, Department of Agriculture, Blenheim, traces the development of farming in the district and describes sheep farming and mixed farming practices. The second part of the article will include a description of other types of farming in the province, including a section on the Sounds country.

THE Land District of Marlborough comprises approximately 2,800,000 acres ranging from plains to fairly high mountains. Of this 2,415,000 acres are occupied, being divided into 1854 holdings with an average area of 1296 acres. The district is shaped roughly like a parallelogram bounded by the sea along the eastern and northern sides. The inland boundary runs, in the south, from the mouth of the Conway River along the river in a general north-westerly direction, then north along the Acheron River, and later in a general north-easterly direction via the Pelorus River and Rai Saddle to Pelorus Sound.

History

Settlement by Europeans was planned by the New Zealand Company to begin about 1843, but a dispute with the Maoris regarding ownership of the Wairau Valley unfortunately resulted in the Wairau massacre, and after this there was no settlement for some time.

In 1847 Mr. G. Clifford (later Sir George) and Sir Frederick Weld brought 3000 sheep from Sydney to stock the Flaxbourne run, and in the same year Mr. N. G. Morse and Dr. Cooper drove a flock of sheep from Waimea to establish the run now known as Tophouse, which borders the Marlborough Province. Then followed Mr. G. Duppa, first holder of Birch Hill, Mr. C. F. Watts, of Lansdowne, and Mr. A. J. Jenkins, who occupied Hillersden Station. By 1850 occupation licences had been issued to holders of 45 runs, including such well-known properties as Hawkesbury, Avondale, Starborough, Upton Downs, Blairich, The Delta, Benhopai, Leefield, Upcot, Gladstone, and Molesworth.

Agricultural farming had begun early in the Wairau Valley. Among the first farmers were Mr. C. Murphy, of Springlands, and Mr. H. Godfrey, of Woodbourne, the latter being the first really systematic agriculturist in the province. However, it was not until 1847 that a general influx of agricultural farmers took place, most of them coming from Waimea to Wairau Valley. From early times the lower Wairau Valley was troubled by the flooding of rivers, which made extensive protective work necessary. Provision was also made to drain swamps, making valuable land available for farming.

After 1860 farming suffered a setback owing to two factors—expenditure on public works attracted labour to the roads rather than the farms, and the discovery of gold in 1864 robbed the land of still more labour. The latter event led to a considerable increase in the province's population, which in 1864 reached 5500. At this time there were 8189 acres in crops and the sheep population totalled 456,000.

Lowland runs were suited to more intensive use than range grazing, and

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HEADING PHOTOGRAPH: Mustering sheep on typical Marlborough hill country. National Publicity Studios photo.

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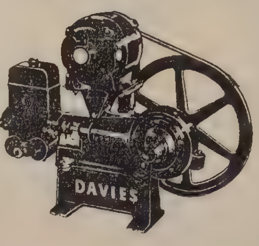

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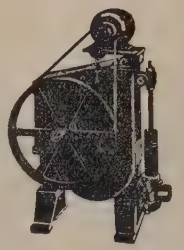

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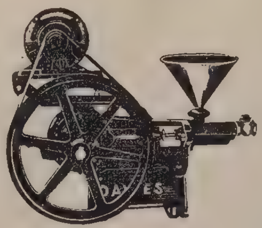

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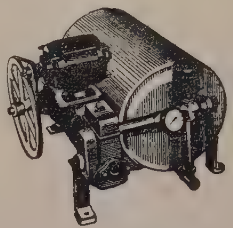

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at intervals after 1895 they were subdivided into mixed agricultural and pastoral farms. Records show that 22 runs totalling 224,090 acres became 543 separate holdings. Thus settlement gradually became more intense, with mixed farming the main pursuit in Wairau Valley and on the rolling country to the south, sheep grazing on the lighter and the higher country, and dairying about Kaikoura and on areas cleared from forest such as Rai Valley and Mahakipawa. The uplands, being suited only to extensive grazing, remained in large holdings, most of the original pastoral runs in these parts still surviving.

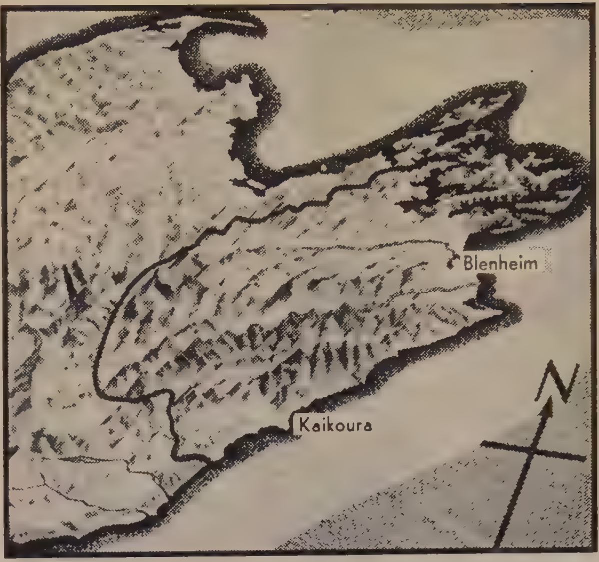
Closely linked with the progress of the whole district was the provision of transport. The railway from Picton reached Opawa River in 1885, and Seddon in 1902, and after numerous delays Picton and Christchurch were linked by rail in 1945. In addition transport by road and air helped to break down the isolation which had made this most central province of New Zealand so remote from its neighbours.

Topography

The rugged nature of most of the Marlborough Land District has moulded its development. Difficulty of access owing to topographical barriers led to separate, small, closely settled areas on the lowlands and to extensive sheep farming on very large holdings in the higher tussock country.

Closely spaced parallel mountain ranges, separated by narrow, gorge-like valleys, form most of the district. The ranges, which rise to over 9000ft., consist of greywacke and argillite and lie in a north-east to south-west direction. The main rivers, the Wairau, Awatere, and Clarence, are guided for most of their courses by these main structural features.

The district may be conveniently divided into three topographical units:—



[From a map prepared by the New Zealand Education Department.
Relief map of Marlborough. The boundaries of the province are indicated by the black line.

[V. O. Browne photo.
The greater part of Marlborough comprises hilly to mountainous country, and of its total occupied area of 2,415,000 acres only 9 per cent. can be ploughed or disced. The illustration shows the mouth of the Clarence River, with the Seaward Kaikoura Range in the middle distance and the Kaikoura Range in the far distance.

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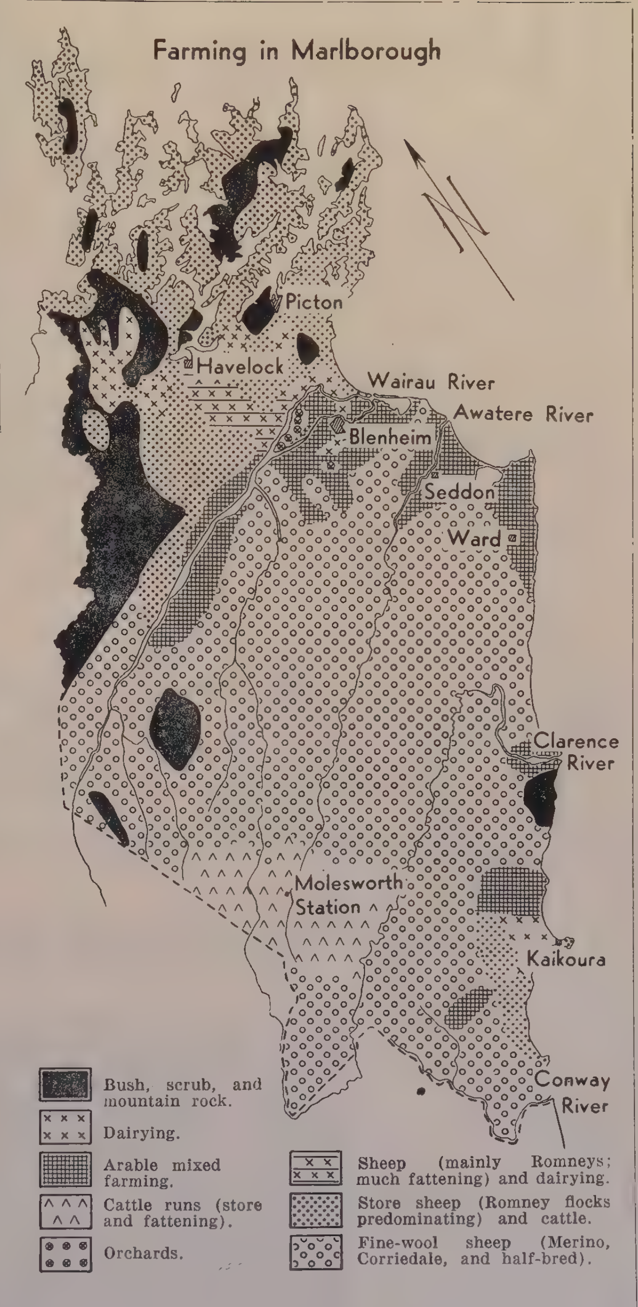
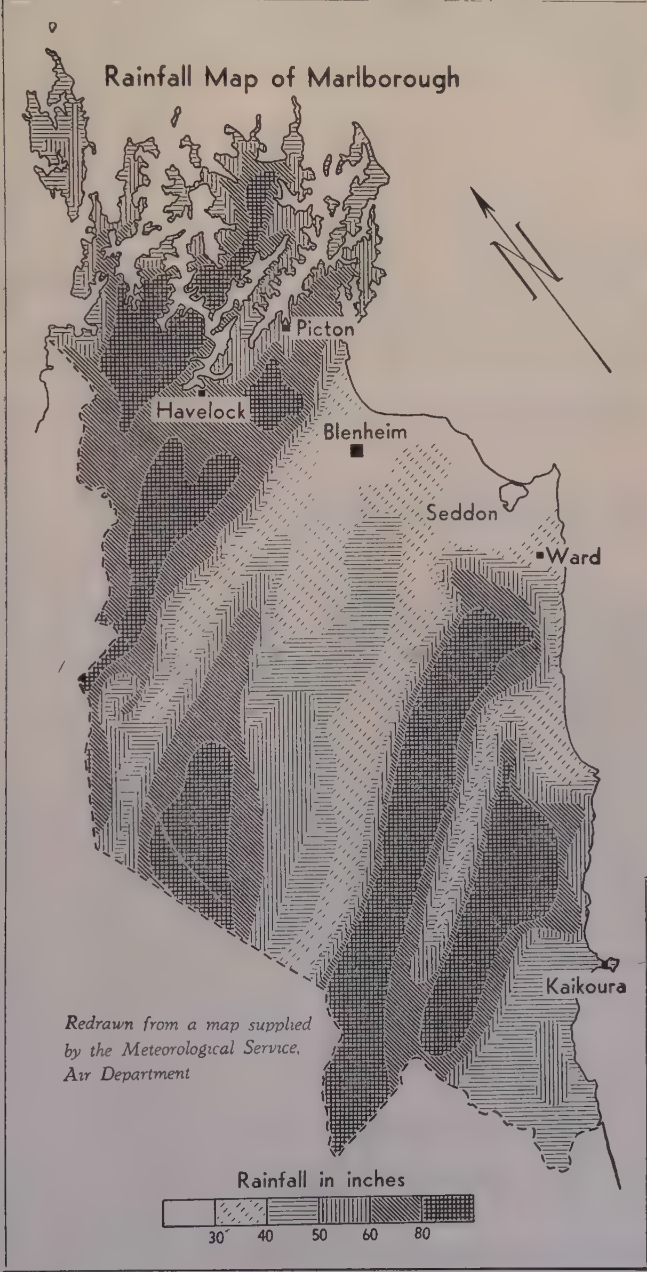
North of the Wairau River

All of the district north of the Wairau River is composed of steep, rugged country and narrow valleys resulting from an intricate dissection by branching streams. Subsidence of the area has caused two of the main valleys in the northern and eastern section to be invaded by the sea. This submergence of the main valleys, and of shorter tributary valleys, has caused the intricate and very long coastline of the Pelorus and Queen Charlotte Sounds. In and about the Sounds most of the mountains are below 2000ft., but further inland they rise to over 4000ft. Flat areas are restricted to the valley bottoms, the main valleys being the Tuamarina, Kaituna, and Rai, and small bay heads such as that on Okiwa Bay.

Lower Wairau and Awatere Valleys

To the south of the Sounds area lies the most important and intensively farmed area of Marlborough, the Wairau Valley. The Wairau River follows a straight course from Tophouse in the west almost to the sea. It is confined to a fairly narrow valley until a point some 20 miles from the coast. At this point the bordering ranges begin to diverge and a triangular plain has been formed between them as a result of the filling in with alluvial sediments of a depression formerly invaded by the sea. The Wairau Valley is relatively flat except where shingle fans from the bordering Vernon Range have spilled on to it.


Farming in Marlborough
N
Picton
Havelock
Wairau River
Awatere River
Blenheim
Seddon
Ward
Clarence River
Molesworth Station
Kaikoura
Conway River
Bush, scrub, and mountain rock.
Dairying.
Arable mixed farming.
Cattle runs (store and fattening).
Orchards.
Sheep (mainly Romneys; much fattening) and dairying.
Store sheep (Romney flocks predominating) and cattle.
Fine-wool sheep (Merino, Corriedale, and half-bred).



Redrawn from a map supplied by the Meteorological Service, Air Department

Separating the lower portions of the Wairau and Awatere Valleys is the Vernon Range. From a height of about 900ft. near the coast, where it varies from rolling to steep country and consists of coarse gravels, it rises gradually and finally merges into the more rugged, hard-rock mountains of the main chain.

The Awatere Valley is composed of wide, flat terraces which end in cliffs at the coast. Rolling and downland country mostly under 500ft. occupies the area between Seddon and Ward.

Kaikoura Ranges and Southern Hill Country

With the exception of the Kaikoura lowland and small areas of coastal plains and river terraces the remainder of Marlborough is occupied by rugged ranges and intervening valleys. The main ranges are the Kaikoura Range and the Seaward Kaikoura Range, which consist of greywacke and argillite and rise to over

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[*Photographs by V. O. Browne (left) and National Publicity Studios (right).*

On the eastern coastal part of the province, except for a few small flat areas (left), high hill country extends right down to the coast (right).

9000ft. The Clarence River flows between these two ranges, breaking through the Seaward Kaikouras to the sea. From the mouth of the Clarence River southward mountainous country extends to the coast. Several miles north of Kaikoura the ranges curve inland and are fronted by a valley lowland at the eastern extremity of which lies Kaikoura.

The area from the lowland to the southern boundary of the district is occupied by yet another steep range, the land rising to about 3000ft.

Climate

With its high mountain ranges and river valleys there are considerable climatic differences in Marlborough.

On the flat coastal area around Blenheim and Seddon the mean annual rainfall is approximately 25in. Up the river valleys of the Wairau and the Awatere it ranges between 30 and 40in. a year and on the higher mountainous country and parts of the Sounds it exceeds 80in.

TABLE 1—MEAN ANNUAL RAINFALL

	in.
Rai Valley	86.1
Havelock	61.9
Blenheim	24.9
Seddon	25.0
Kaikoura	37.0

The monthly distribution of rain is fairly even, the summer months in the Wairau Valley having the least rainfall. Although Blenheim and Seddon have practically identical annual precipitation figures, the effective precipitation is greater at Blenheim than at Seddon, because of a greater incidence of wind in Seddon. Other places of high wind incidence are Grassmere, Cape Campbell, and Ward.

The range of mean temperatures in the Wairau Valley is approximately 19 degrees. Blenheim has a mean temperature of 63.3 degrees in February and 44.6 degrees in July. Inland the range is greater; for instance, at Molesworth the mean temperature for January is 57.0 degrees and for July 34.7 degrees, and there an average of 224 ground frosts is recorded each year compared with 104 at Blenheim.

Protected as it is from prevailing winds by mountains and hills, the lower Wairau Valley has a considerable amount of sunshine, the annual average of bright sunshine for Blenheim being 2431 hours, which is among the highest recordings in the Dominion.

Soils

The soils of Marlborough may be conveniently described in three divisions: Soils of the flat lands; soils of the undulating and rolling lands; and soils of the hilly and steep lands.

Soils of the Flat Lands

Flat-land soils comprise those on river flats, swamps, and reclaimed coastal lagoons, which are extensive in the Wairau Valley and in small areas elsewhere in Marlborough. These soils have been gradually built up by the accumulation of water or wind deposits and their properties vary with the composition of the added materials, the rate of accumulation, and the drainage.

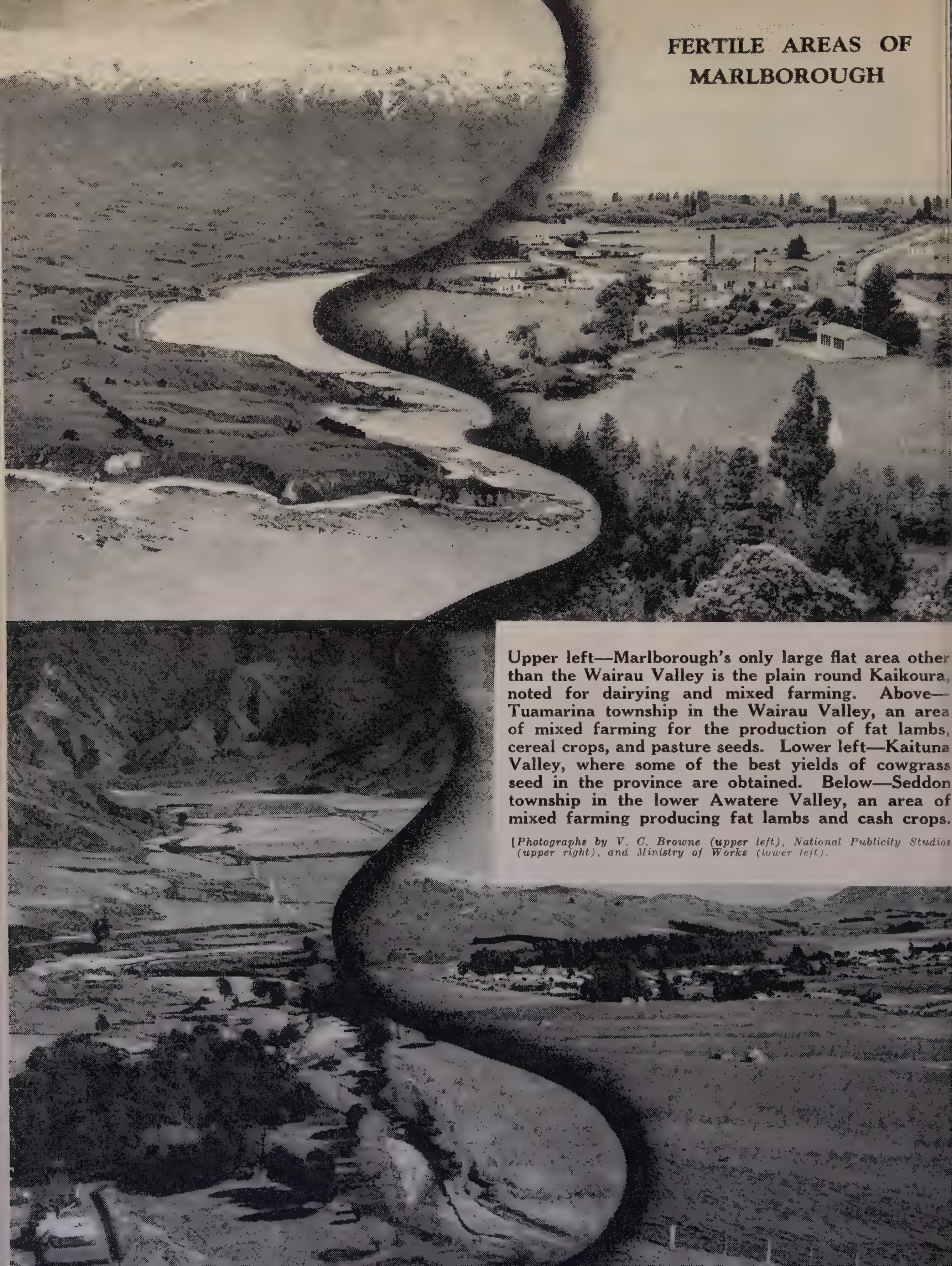
Free-draining soils near the riverbanks such as the Opawa and Wairau types are high in phosphate and lime, and their productivity depends mainly on soil moisture. High yields of grain, pasture seed, and fodder crops are obtained from a silt loam, and lower but quite satisfactory yields from a sandy loam, but the low moisture-holding capacity of the gravelly type makes growth irregular, and utilisation is limited to the grazing of volunteer pastures. Slow-draining silt loams on river flats near Spring Creek and Kaikoura carry excellent pastures for dairying, and in seasons which are drier than average the Spring Creek soils provide high crop yields. On low alluvial terraces, now rarely flooded, the soils are higher in organic matter but lower in lime and available phosphate than the more rapidly accumulating soils of the flood plains. With phosphate topdressing high yields of grain and fodder crops are obtained on the deep Fairhall and Omaka soils, and moderate, less reliable yields on the shallow types. Stony Taumutu soils bordering parts of the coast drain very rapidly and moisture shortages limit the growth and kind of pastures. On the other extreme the silty and peaty soils in the swamps and the saline soils in the coastal marshes need draining before they can be used for dairying or for cropping. Stony and sandy loam soils on the sloping fans formed by streams draining the Seaward Kaikouras are less fertile than the soils on the river flats and need topdressing with phosphate and lime to establish high-quality pastures for dairying or sheep fattening.

Soils of the Undulating and Rolling Lands

On undulating and rolling lands soil development depends principally on climate and vegetation. The soils may be subdivided into the Sedgemere-Renwick, the Jordan-Hillersden, and the Kaituna-Branch soils. The first-mentioned type of each group represents a fine-textured member, and the second-mentioned a stony member.

The Sedgemere-Renwick group of soils is formed on the coastal lowlands between Blenheim and Ward under a warm, dry climate and low tussock grassland. Fine-textured soils consist of grey, very friable silt loams over yellow, strongly compact clay loams. Soil moisture varies widely throughout the year, topsoils becoming dry in summer and often waterlogged in winter and early spring. Renwick stony loam is always well drained, but dries out rapidly in droughty periods. These soils are used for mixed cropping and sheep farming, high production depending on making the best use of rain during the growing season by the maintenance of the structure and organic content of the topsoil.

FERTILE AREAS OF MARLBOROUGH



Upper left—Marlborough's only large flat area other than the Wairau Valley is the plain round Kaikoura, noted for dairying and mixed farming. Above—Tuamarina township in the Wairau Valley, an area of mixed farming for the production of fat lambs, cereal crops, and pasture seeds. Lower left—Kaituna Valley, where some of the best yields of cowgrass seed in the province are obtained. Below—Seddon township in the lower Awatere Valley, an area of mixed farming producing fat lambs and cash crops.

[Photographs by V. C. Browne (upper left), National Publicity Studios (upper right), and Ministry of Works (lower left).

The Jordan-Hillersden soils occur in the middle portions of the Wairau, Waihopai, and Awatere Valleys and in the coastal belt between the Flaxbourne and Conway Rivers. They are formed under a mild, humid climate and an original vegetation of mixed shrubland and beech forest. Topsoils are brownish-grey silt loams which below 7in. grade into yellow, slightly to moderately compact clay loams. Compared with soils of the first group, they rarely suffer droughty periods, and the improved moisture conditions result in a greater lime and fertiliser requirement for high pasture or crop yields.

The Kaituna-Branch soils are formed in the cooler and wetter lowland parts of Marlborough where the native vegetation was mixed beech and rain forest. Under these conditions in the Rai, Koromiko, and upper Wairau Valleys soluble materials are continually being lost from the soils, which are more leached than in the other regions of Marlborough. Topsoils are brown, friable silt loams passing abruptly to yellow subsoils of similar consistence and texture 6in. or less from the surface.

Similar soils have formed under tussock grassland in high basins of the Clarence and Awatere Valleys and are known as Molesworth soils. The vegetation on these Molesworth soils has been severely depleted by overgrazing with sheep and rabbits and under the prevailing extremes of climate plant regeneration is slow.

Soils of the Hilly and Steep Lands

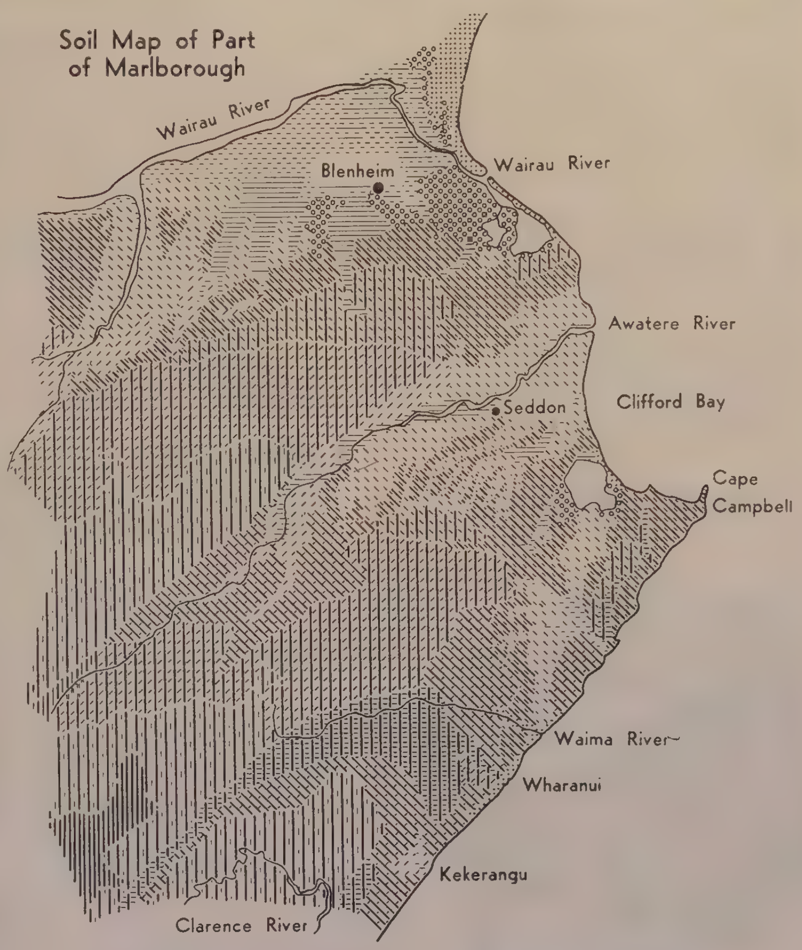
The soils of the hilly and steep lands are derived chiefly from sandstone or mudstone. They are similar in general properties to those on the adjacent valley land, except that the topsoil and subsoils are shallow and contain pieces of the underlying rock. Run-off is rapid and the soils require a dense cover of vegetation to conserve moisture and prevent soil erosion. Adequate pastures for these purposes can be maintained under controlled grazing on hilly and steep slopes, except in the cool or wet regions, where the soils are poor and susceptible to rapid erosion.

Soils derived from limestone and basalt differ in colour and in texture from other soils on the hilly and steep lands, but have similar moisture and erosion problems.

Rock and scree lands occur above altitudes of 5000ft., where the land surface consists of rock fragments with a thin filling of sandy soil under isolated alpine plants. Erosion is rapid, but is normal for this region.

Trends in Production

The relative ease of development of the flat and gently rolling country has resulted in most effort and research being spent on the improvement of this type of country. The productivity of this land has accordingly risen. Production of the high country, on the other hand, after the initial good results from seeding after the burning of bush or tussock, has shown a general decline. The extent of this decrease has varied widely from holding to holding, and in some instances land has gone out of production. On the whole, however, records show little change in the carrying capacity of the region, as increases on the lowlands have been balanced by decreases on the higher country.



From a soil map supplied by the Soil Bureau, D.S.I.R. Wellington

- ░ 1. Opawa-Wairau soils on free-draining river flats.
- ▤ 2. Spring Creek soils on slow-draining river flats.
- ▤ 3. Fairhall-Omaka soils on low terraces.
- ░ 4. Taumutu soils on stony and sandy beach banks.
- ▩ 5. Saline and fresh-water swamp soils.
- ▨ 6. Sedgemere-Renwick soils on undulating lands.
- ▨ 6H. Soils on hilly lands associated with 6.
- ▥ 6S. Soils on steep lands associated with 6.
- ▨ 7. Jordan - Hillersden soils on undulating lands.
- ▨ 7H. Soils on hilly lands associated with 7.
- ▥ 7S. Soils on steep lands associated with 7.
- ▥ 8S. Kaituna-Branch soils on steep lands.
- ░ 9. Molesworth-Acheron soils on undulating lands.
- ▦ 10. Soils derived from limestone on steep lands.
- ▥ 11. Soils derived from basalt on steep lands.
- ▥ Bare rock.

The economic depressions of the early 1920's and early 1930's were accompanied on the lowland farms by increases in dairying and cash cropping at the expense of sheep numbers. Recently, however, the reverse has applied, the exceptional prices paid for wool and the good returns from stock generally encouraging the carrying of increased numbers of stock at the expense of cropping.

A marked general trend over a period of years has been an increasing emphasis on fat-stock production. Improved methods of transport and improvements in lowland pastures, accompanied, of course, by good prices for fat stock, have been the main causes. This has produced a general

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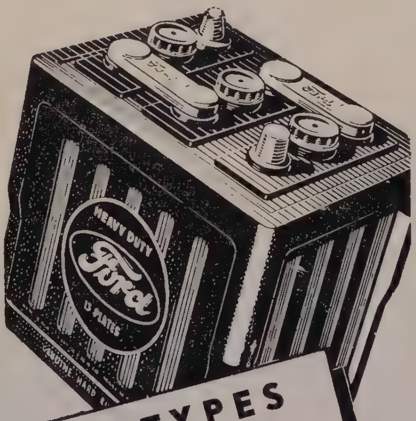

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trend from fine-woolled to coarser-woolled breeds of sheep.

Another trend has been the increase in beef cattle. However, it will be many years before anything near the optimum number of cattle are run in Marlborough, the two main reasons being a lack of appreciation of the full value of cattle in general pasture management and a lack of suitable fencing. However, interest in cattle is increasing steadily.

TABLE 2—NUMBER OF CATTLE IN MARLBOROUGH OTHER THAN DAIRY COWS IN MILK

Year	Number
1919-20	29,854
1924-25	29,975
1929-30	31,157
1934-35	24,948
1939-40	27,930
1944-45	33,827
1949-50	43,892

Land Utilisation

Of the total occupied area of 2,415,000 acres in the land district, 84 per cent. comprises unimproved land, of which 1,360,000 acres are in tussock and native grasses and 275,000 acres in fern, scrub, and second growth. The area in sown grasses is 337,000 acres and it is on this and the tussock and fern areas that the district grazes its 1,020,000 sheep and 57,300 cattle, including dairy cows.

Cropping is an important feature on part of the Wairau Valley, the total area in cereal and pulse crops in 1949-50 being 16,712 acres. Peas occupied nearly 8000 acres, which was 20 per cent. of the Dominion acreage.

TABLE 3—LAND UTILISATION IN 1949-50

	Acres
Unimproved land	2,040,768
Sown grass, clover, and lucerne	337,101
Cereal crops for threshing	8,738
Peas for threshing	7,974
Green fodder and root crops	13,512
Potatoes and onions	100
Plantations, orchards, market gardens, etc.	9,571

[*Department of Lands and Survey photo.*

Soil erosion, caused by overgrazing, overburning, and rabbits, is a problem in many parts of Marlborough. The illustration shows the Wither Hills, near Blenheim, where erosion has been severe.

Types of Farming

Sheep Farming

Of Marlborough's total occupied area of 2,415,000 acres, 2,199,000 acres are too steep to be ploughed or disced; this means that sheep farming is likely to remain the predominant farming system of the district.

From 1847, when the first flocks were introduced, sheep numbers increased steadily to 850,264 by 1890. There was a subsequent decrease, but over the past 40 years there has been no great variation in numbers.

TABLE 4—TOTAL SHEEP IN MARLBOROUGH

Year	Number
1900	751,321
1911	1,072,946
1920	1,011,741
1930	1,168,060
1935	1,092,942
1940	1,145,583
1945	1,091,474
1950	1,019,344

Because of the importance of sheep to farming in Marlborough it was to be expected that over the years a high-quality type of sheep would be produced. This has proved to be so, and the general standard of flock sheep in the district compares most favourably with that of sheep in any other part of the Dominion. This has resulted from careful and intelligent breeding and selection work by stud owners and the clean, healthy nature of most of the sheep-breeding country.

On the higher hill country the main sheep breeds are the Merino and half-bred, the Merino predominating on the highest and most rugged country. However, over the last 15 to 20 years there has been a noticeable tendency for Merino numbers to decrease, this breed being replaced by half-breds and Corriedales on the easier hill country. During recent years, too, Corriedales have increased at the expense of half-breds, apparently because Corriedales fatten more readily and surplus and aged ewes are thus easier to dispose of for fat-lamb production. Romney numbers have also increased rapidly, owing partly to the growth of the fat-lamb trade in line with pasture improvement.

TABLE 5—BREEDS OF RAMS AS A PERCENTAGE OF TOTAL RAMS IN MARLBOROUGH IN 1950

Breed	Percentage of total
Romney	28.5
Half-bred	26.2
Merino	13.5
Southdown	16.4
Corriedale	9.9
Other breeds	5.5

The size of flock has tended to decrease over the years. Before 1900 many flocks exceeded 5000, but today they are mainly smaller, with approximately 20 per cent. in the 1000 to 2500 group. Flocks of fewer than 500 are common on the mixed farms on the lowlands of the Marlborough and Kaikoura Counties. With a large proportion of the region consisting of high to rugged country, sheep farming in these areas is confined to the production of wool. Owing to losses caused by severe snowfalls and by wild pigs at lambing, it is not normally possible to supplement the income from wool with that from the sale of cull stock.

[*National Publicity Studios photo.*

A mustering scene on Marlborough high country.

Lucerne grows well in Marlborough and is used for hay, grazing, and seed production.

On this type of country the runholder is largely at the mercy of the elements, and it is extremely important that he should farm with much in reserve in normal years. Overstocking is fatal both to thrift of stock and of pastures.

On the lower hill country the chief breeds of sheep are the half-bred and Corriedale. (Sounds County is an exception, the Romney being of chief importance.) This may be classed as the sheep-breeding country, as sales of stock normally provide an appreciable supplementary income to that from wool. Stock sales consist of sound- and failing-mouthed ewes, wethers, store lambs of both sexes, and store or fat cattle. The ewes, wethers, and wether lambs pass to the lowland fattening farms for the breeding of fat lambs or for fattening. The ewe lambs sold are for flock replacements on low country as is also a small percentage of cull 2-tooth ewes. Wethers are usually sold off shears in November and December, and the ewes in February and March after weaning is completed, either privately or through the saleyards.

On some of these breeding runs where an appreciable area of low, easy country is available a limited degree of fattening is carried on. This has increased in recent years as a result of the improvement of the lower country through topdressing and surface sowing of seed.

As already indicated, beef cattle numbers are increasing steadily in Marlborough. This increase has taken place mainly on the sheep-breeding country, where cattle are proving invaluable in the more efficient utilisation of pasture growth, as well as in providing an additional source of income. Sales consist chiefly of store or fat steers.

Mixed Farming

The mixed farming is varied and includes sheep and arable cropping, with small seeds production, sheep and dairying, sheep and small seeds production, and dairying and small seeds production. All these types are practised to some degree in the area, but the last three are of minor importance compared with the first.

The main centre of the mixed cropping and sheep farming is the Wairau Valley area surrounding Blenheim, Tuamarina, Spring Creek, Rapaura, and Fairhall. This is the most intensively cropped area in the region, owing to the suitability of both soil and climate for this type of farming. On the more fertile land of the area yields of barley sometimes exceed 100 bushels per acre and wheat 80 bushels per acre. A yield of 60 bushels or more per acre is normally expected from wheat on the good cropping land.

The main cash crops are peas, barley, wheat, and oats. Small seeds crops are made up chiefly of cowgrass, ryegrass, white clover, subterranean clover, and onions. Yields and seed quality of these crops are normally good, though returns from white clover and subterranean clover are more variable than those from the others owing to the greater influence of climate on these two crops.

TABLE 6—AREA IN GRAIN, PULSE, AND PASTURE SEED CROPS 1949-50

	Acres
Wheat for threshing	3,428
Oats for threshing	778
Barley for threshing ..	4,492
Peas	7,974
Perennial ryegrass	631
Red clover	4,361
White clover	1,000
Other grasses, clovers, and lucerne	1,183

In addition to cash crops, greenfeed crops are grown for wintering or fattening stock. Greenfeed oats and barley, which in 1949-50 occupied 3260 acres, are extensively used for grazing in late autumn, winter, and early spring, and rape is widely grown for lamb fattening. The use of kale is increasing at the expense of rape, being used for fattening and/or wintering of stock. Turnips are also grown, though not extensively, on the mixed farms.

Hay, produced mainly from cowgrass and lucerne stands, is saved by most farmers for winter feed, but silage is very uncommon on mixed farms. Hay serves also as a cash crop on some properties.

Normally, under this type of management ewes are bought in each autumn and fat lambs taken, the ewes themselves being fattened when of no further use for breeding. Romney ewes are commonly used on these farms, though half-breds and Corriedales are also important. Southdown and Romney rams are the main types used.

TABLE 7—AREAS IN FODDER CROPS IN 1949-50

	Acres
Rape	4,709
Kale (including chou moellier)	1,026
Cereal crops fed off ..	3,293
Other green fodder crops .	311
Swedes	869
Turnips	1,277
Turnips and rape mixed ..	132
Grass and clover cut for hay and silage	4,920
Lucerne cut for hay and silage	2,086

Some farmers buy 4-year-old ewes from the hill country and hold them for several years before discarding them as unsuitable for further fat-lamb production. On the larger properties a proportion at least of ewe requirements is sometimes bred. To meet these requirements a Romney flock will be run, a proportion of the ewes being put to the Romney ram to maintain the flock, and the remainder to the Southdown ram for fat-lamb production.

Other sheep frequently handled on mixed farms are wethers. These are generally bought off the shears from the breeding country in November and December and fattened.

Thus, returns on mixed farms in this area are received from the sale of grain, small seeds, hay, fat lambs, other fat sheep such as wethers and ewes, and, occasionally, fat cattle.

Another important centre of this type of farming is Seddon, though in this area holdings are generally larger and the emphasis is more on sheep than cropping. The main crops here are peas and wheat; oats, barley, lucerne, ryegrass, and white clover are also important.

Other centres are Ward and Hillersden, though here still less emphasis is placed on cropping. Crops are wheat, oats, and peas at both centres, lucerne at Ward, and subterranean clover at Hillersden.

On a few farms near Blenheim practically the whole emphasis is on cropping, few, if any, sheep being run. The main crops are peas, barley, wheat, oats, cowgrass, and lucerne, the last two being used to spell the ground from arable cropping for a few years.

Examples of the less common types of mixed farming are found in different parts of the district and are not of great importance. Some dairy farms, for example, at Kaikoura and Blenheim, also run sheep, usually where an area of hill country adjoins the flat land on the one property. Some dairy farmers, too, at both these centres and at Rai Valley set aside small areas for seed crops such as red clover, ryegrass, or white clover.

Similarly, sheep farmers in the Charwell district, in Kaikoura, and in the Wairau Valley area sometimes supplement their income by small seeds production, but, as with dairying and small seeds production, the cash return from seeds is normally only a small sideline to that from stock. Often, too, on these properties a proportion of the half-bred or Corriedale ewes will be put to the Southdown ram for the production of fat lambs on the front country.

The information on soils in this article was provided by H. Gibbs, Soil Bureau, Department of Scientific and Industrial Research, Wellington.

Successful Wintering of Bee Colonies

Seasonal Notes for the Domestic Beekeeper

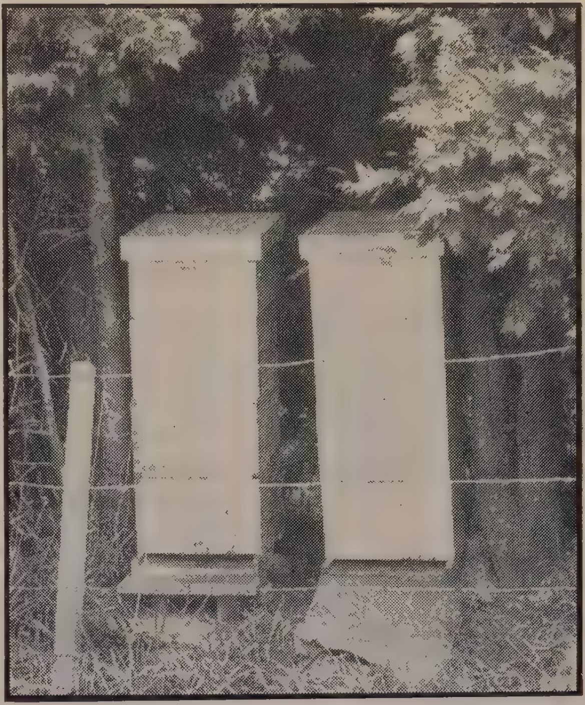
IN almost all parts of New Zealand the winter is milder than in most other beekeeping countries. Despite this a considerable number of bee colonies either die out in winter or emerge from it weakened. This is generally brought about by the failure of beekeepers to give their bees correct attention during autumn. Management required for the successful wintering of bee colonies is discussed in this article by T. P. J. Williams, Apiary Instructor, Department of Agriculture, Hamilton.

COLONIES of bees should be given every assistance to enable them to survive winter, which to them is an extended period of shortage of both pollen and nectar. The principal causes of winter loss are starvation and to a less extent weak colonies, queen failures, bee diseases, and general mismanagement.

Before a hive is closed down for winter it should be examined to ascertain whether it has an adequate supply of honey and pollen, has a good strength of young bees headed by a good queen, and is free from disease. The hive should be protected from prevailing winds with hive material that is close fitting and rainproof.

In New Zealand colonies appear to winter best in two full-depth boxes, and it is therefore necessary to remove all surplus supers above the second box. Sufficient comb room should be left in the middle of the brood nest to allow space for the queen to continue brood rearing and for the bees to cluster comfortably. It is important that the age and condition of the queen be checked, as her vitality must be unimpaired if she is to carry the hive through winter and spring in a prosperous condition. A young queen will breed right into winter, which will enable the colony to come out strong with young, vigorous workers in spring.

In the South Island hive entrances may be contracted to about 3in. x ¼in. by using an entrance block made from a piece of wood. However, in most North Island districts, though the entrance should be no more than ¼in. deep, it would be inadvisable to alter the width. Hive mats should be removed where flat lids are used. This is very necessary in the Waikato, Auckland, and Northland to enable hives to keep dry throughout winter.



Beekeepers should not go to the extreme shown here when providing shelter for hives. Sites such as this are damp and draughty.

A close examination should be made of all brood for the presence of American foul-brood disease. The symptoms of this disease were described in the domestic beekeeping notes in the September 1952 issue of the "Journal".

Weak Colonies

Weak colonies usually result from poor queens or restricted brood rearing during summer. It is inadvisable to winter such colonies, as they do not build up sufficient strength during spring to be able to take advantage of the honey flow. It is much better to unite a weak colony to another hive by killing the older queen and placing the complete brood nest, the queen, and all the bees of the other hive on top with a sheet of newspaper between the two colonies. The bees will chew through the paper and unite peacefully.

Winter Stores

The amount of honey the colony will require to sustain it through winter and early spring should be determined according to the district, for in a number of areas there are spring sources of nectar such as willow and barberry which may be taken into account.

The colony should, however, be allowed 50lb. of well-ripened honey. If this quantity cannot be provided, the shortage may be supplemented by feeding a heavy solution of sugar syrup. Information on this may be obtained from one of the Department's Apiary Instructors. Many beekeepers fail to provide a margin of safety and eventually lose a year's crop of honey through leaving the colony a few pounds short. The weight of honey in a hive may be gauged fairly accurately by reckoning a full-depth frame of sealed honey to contain 5lb. In most areas there is an abundance of pollen, but it would be advisable to check the combs, for the hive will require at least the equivalent of two full combs of pollen.

Shelter

Colonies should be situated where they will receive maximum sunshine and protection from prevailing winds and cold draughts. Hives should be placed with their entrances facing north so that all sunshine falls on the fronts of the hives. A site with a hedge at the back of the hives which may be trimmed to about 6 or 8ft. provides good shelter. A board fence will also make a satisfactory windbreak.

Many beekeepers make the mistake of placing hives up against a hedge or belt of trees as illustrated above. Hives should be placed no closer than 3ft. from the shelter. An article by L. A. Griffin which appeared in the September 1952 issue of the "Journal" deals fully with apiary sites.

Storing Bee Combs

Any surplus combs should be stored in a dry place and protected from wax moth and mice. The domestic beekeeper usually has only a few boxes of combs to be stored away during the off-season. The first box should be placed on a flat cover or a piece of tin with a few crystals of paradichlorobenzene (P.D.B.) placed on a piece of cardboard or other material on the top bars of the frames. A sheet of newspaper is then placed over the box and the next box placed on top as tightly as possible. More crystals are placed on this box, and the process is repeated with the remaining boxes. When the tier is completed a hive lid is placed on the top.

These combs should be inspected periodically and more crystals added if necessary. Paradichloro-benzene is a white crystalline substance which evaporates slowly in air. The vapour is heavier than air and is not injurious to humans. Provided the crystals are not taken internally this chemical may be used with safety. The natural delicate flavour of extracted honey may be impaired if the combs used are not thoroughly dry and free of all traces of honey when stored away under fumigation. They should be thoroughly aired before being used on the hives.

If the beekeeper is satisfied that he has carried out the work already described, he will not have to give the hives any further attention until spring. During winter an opportunity will be afforded for repairing and painting equipment and making up new woodware for the following season.

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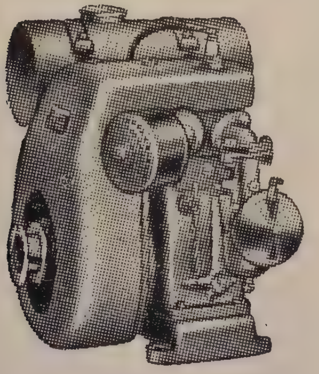

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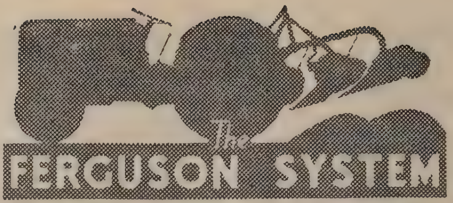

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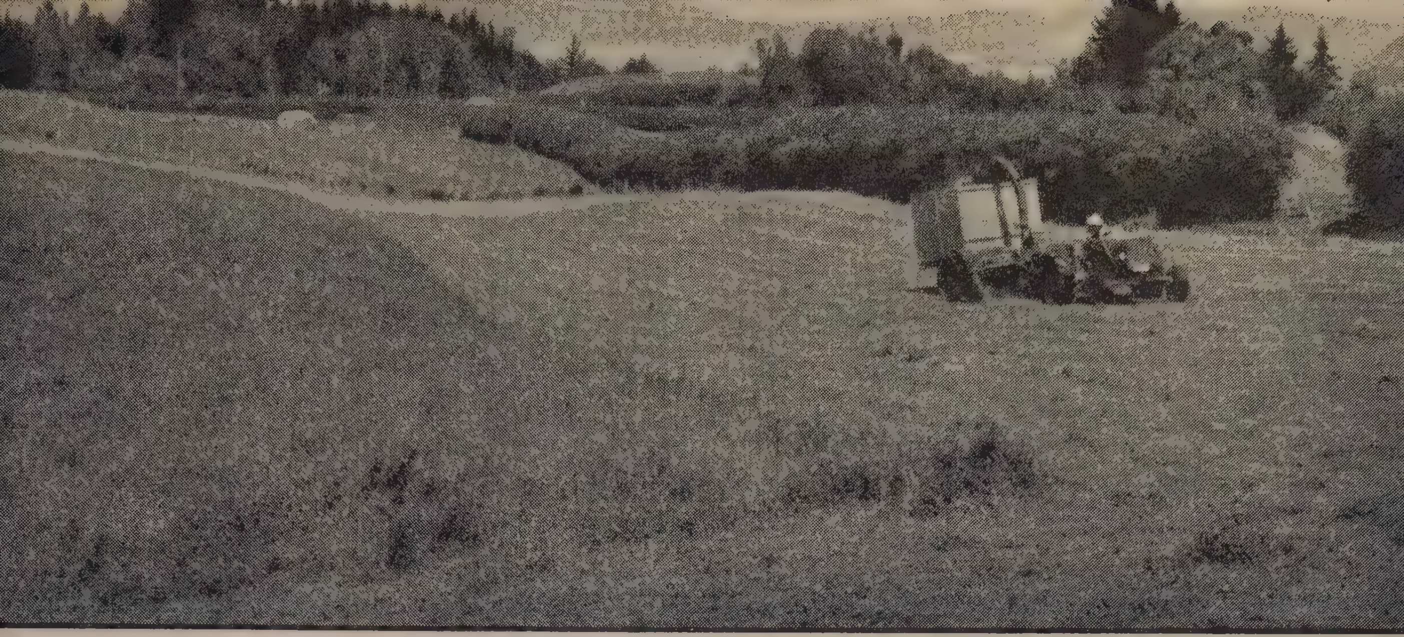


HEADING PHOTOGRAPH: The dairy section (80 acres) of Mr. Dibley's farm. The whole farm comprises 250 acres, the remainder being used for fat-lamb raising.

Silage Making with a Forage Harvester

By C. R. TAYLOR, Fields Instructor, Department of Agriculture, Rotorua

THE making of grass silage is regaining its importance on dairy farms. It was well established in the early 1930s, declined during and immediately after the Second World War, but is now rapidly increasing again. Many factors, including shortage of labour, machinery, and fertilisers, were responsible for the decline in the practice during the 1940s, but the recent impetus to silage making (apart from its feeding and pasture management values) is due largely to the availability of machinery for the efficient handling of the bulky green material.

AS a mechanical aid to efficient and economical silage making the forage harvester has its place on many farms where surplus pasturage is conserved as silage on an extensive scale. This is not to say that the area of farms must be extensive—far from it, in fact, as will be seen later—but the forage harvester is of greatest value to the farmer who is really "silage minded" and whose farm lends itself to this type of silage handling. One most important factor in its favour is that it is not a "mankiller" in spite of the huge volume of material it accounts for every day it is at work.

New Method Replaces Old

Up to 1951 Mr. A. D. Dibley, Ngongotaha, Rotorua, had always made silage the hard way; that is, he and two sons stacked it in the orthodox manner with a boom-type stacker. Being a silage-minded dairy farmer who milked a herd of 55 to 60 cows on approximately 80 acres, 10 acres of which were in lucerne and the remainder under permanent pasture, and being particularly concerned with maintaining the high standard of most of his pastures, he looked on silage making as the most reasonable way of achieving good pasture management together with the provision of adequate quantities of good supplementary fodder. To this end Mr. Dibley was in the habit of making 10 to 12 stacks of silage each year (in all 400 to 500 tons) and a very small supply of hay, usually lucerne hay. The work was heavy, even though it was spread over several months.

It was obvious that this work could not be continued for many years with impunity and so Mr. Dibley decided after much serious consideration to examine the claims made for the various modern aids to silage making. Finally he decided on the forage harvester. The cost was extra ordinarily high for a small-acreage farm, but if it did the work claimed for it, the initial cost was as nothing compared with the heavy manual labour involved in his old method of working. And as there never was any thought of giving up silage making—that would never have done if there was some other way out—the obvious course was to change from the old, well-tried but arduous technique to something speedier, less exacting on the physique of men, and comparable in product costs and quality with other methods.

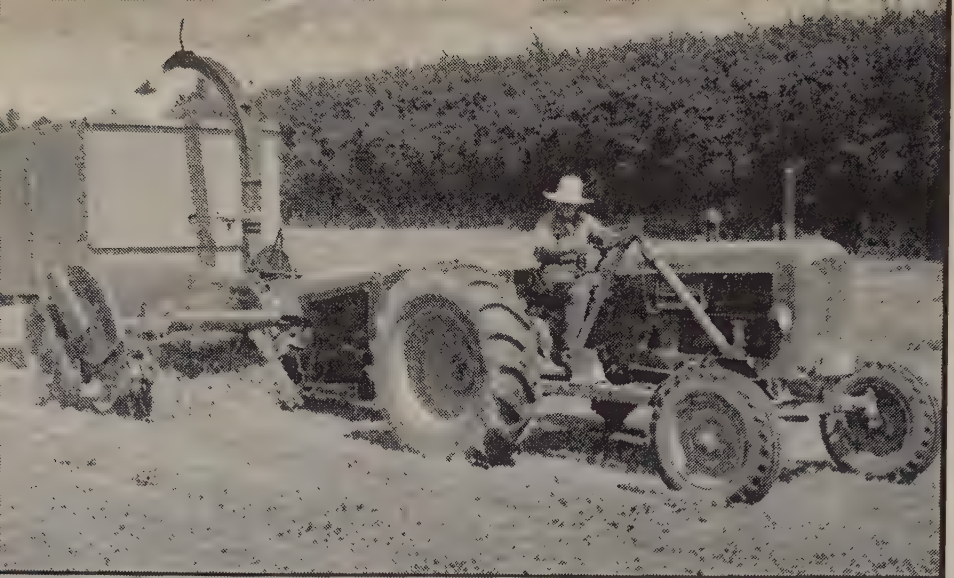
More than a year has passed since Mr. Dibley decided to purchase a forage harvester. In that period he has made a little over 500 tons of silage, all in small stacks of between 40 and 45 tons each, with the greatest ease and speed. On being opened up the ensiled material proved in every case to be at least equal to that made in previous years by older methods and sometimes it was better. In a few instances, however, the amount of waste at the sides was slightly higher. This was thought to have resulted from the more mature stage of growth at which this particular herbage was cut, compared with the younger and leafier growth of other stacks which resulted in just a film of waste. Most stacks on completion were slightly hearted up in the centre and weighted with about 9in. of pumice soil. As an experiment the top of one stack was brought to a steeply pitched peak without any weighting of earth, the result being entirely satisfactory.

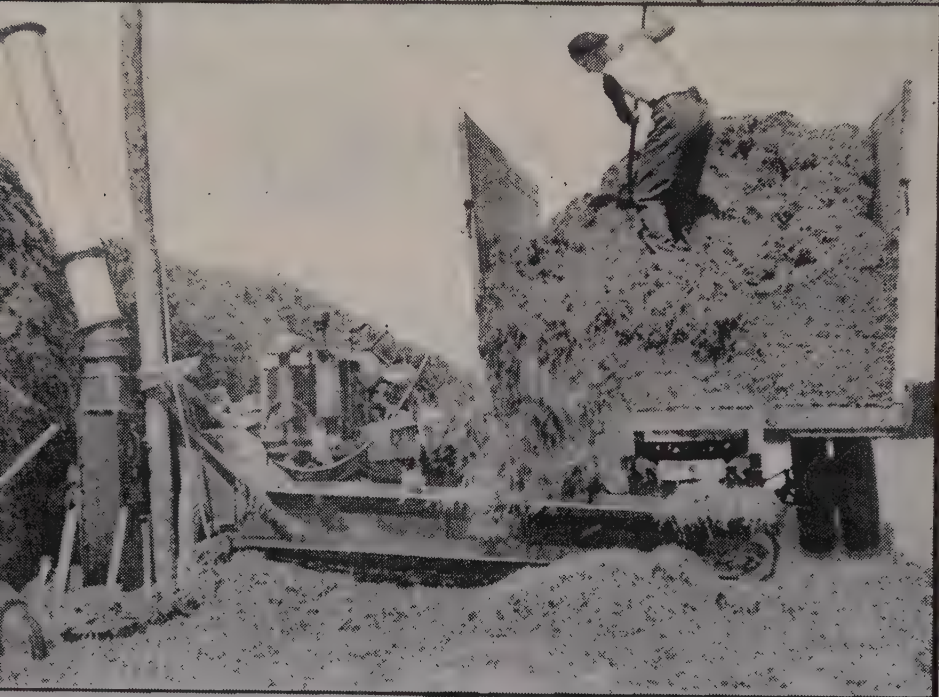
Equipment

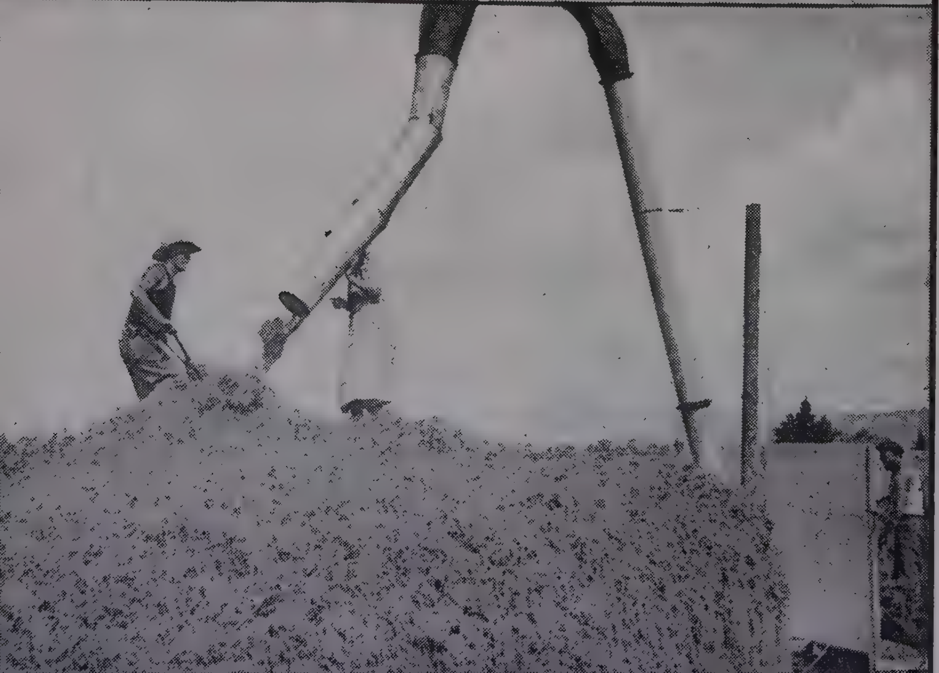
The particular type of forage harvester employed by Mr. Dibley is without its own cutter bar, but comprises a pick-up, chopper, and blower unit coupled with trailer of 3-ton capacity and a separate unit for stacking consisting of a mechanical conveyer and blower. This equipment is illustrated on the next page. By the use of two trailers, each capable of holding 3 tons of chopped material, the entire plant can be kept on the move, one unit picking up from the swath and chopping the herbage into 4in. lengths while the other is unloading on to the conveyer and blower and thence to the stack.

Under average working conditions it was found that the loading of one trailer and the unloading of the other each takes approximately 12 minutes. Thus, if the time lost in changing over trailers is allowed for, 10 to 12 tons of material can comfortably be handled by 3 persons every hour, a 6-acre paddock taking between 4½ and 5 hours to pick up, chop, and stack. Mowing would take extra time because the harvester is not equipped with a mowing attachment. If a fourth worker is available to direct the distribution of chopped material from the blower spout (a girl can easily do this job) to where it is required on the stack, the task of the stack builder is considerably speeded up and made still easier.

To secure the 4in. lengths of chopped grasses and clovers, a length







found most suitable for handling on the stack, it was necessary to remove two of the four chopper blades (a simple operation) and to do away with the tractor power-take-off drive by substituting a separate engine to operate the pick-up and chopper unit. In this manner not only was a very heavy load removed from the tractor, especially on uphill grades, but regardless of tractor speeds the efficient functioning of the pick-up and chopper was maintained through the carefully governed independent power unit. The additional running costs thus incurred were trifling compared with the satisfaction of getting on with the job with the least trouble.

Stack Building

Like everything else that is new in conception and operation, the building of silage stacks with 4in. chopped material blown with considerable force through a freely moving and adjustable spout or nozzle was not at first regarded as particularly easy. However, the initial difficulties were soon overcome by increasing slightly the basal diameter of the stack—a conventionally built stack of, say, 18ft. diameter would be increased to 20ft.—and concentrating on building firm outside edges before bringing up the centre. In this way it was found there was not nearly the same tendency for the short lengths of material to fall away from the sides. The raking down of sides periodically was also found to be advantageous.

Feeding out

In the consideration of the labour and time factors incidental to an extensive use of silage on the farm the making of the product is only one part of the problem. It has already been shown that 3 men can easily handle from 10 to 12 tons of chopped grass per hour, an amount usually considered a fair day's work (between milkings) for 2 or 3 men using the ordinary technique for stacking silage. But what is the position with feeding out, a usually fairly arduous task and somewhat time-consuming one? Questioned on this point, Mr. Dibley stated that his two sons (20 and 17 years of age) saved 40 minutes a day, as no cutting of the compressed silage was necessary and the work of forking material from stack to trailer, etc.,

Upper left—The pick-up, chopper, and trailer unit gathering material for ensiling. The trailer holds 3 tons of chopped material and is filled in about 12 minutes. Middle left—The chopped material being forked down from the trailer on to the mechanical conveyer, whence it travels through the powerful blower on to the stack. Lower left—One man is sufficient on top of the stack, but having two workers is an advantage, as it speeds up the unloading of the trailer and so avoids wasting the time of the pick-up unit, which is doing its job simultaneously with that of the stacking unit. The end portion of the movable delivery spout is built up of short lengths of removable sections to allow for the heightening of the stack.

was simple. The trailer used for feeding out silage is one of the two used in making silage, the sides being removed for feeding out.

Another point of interest mentioned by Mr. Dibley was the ease with which a paddock could be harrowed after chopped silage had been fed out. With the old method of feeding out any silage not eaten by stock after a week or two of feeding out on the one field gradually accumulated and when finally harrowed would tend to gather up into long rolls that were a nuisance for some time afterwards, particularly to a mower or harrow. Chopped silage completely eliminated this trouble and facilitated the subsequent mechanical handling of the pasture in a most efficient manner, something that means much to Mr. Dibley, who believes in frequent and thorough harrowing after every break feeding of his paddocks.

Advantages of Forage Harvester

From this one year's experience of one type of forage harvester it appears that such an implement is capable of playing a beneficial role in the production of silage on many New Zealand farms, especially dairy farms. Though its initial cost is undoubtedly high, its running charges, say, per ton of silage produced (counting in labour), seem reasonably economical, though less so perhaps than when a buckrake is used. Moreover it eliminates the hard work attached to silage making, a factor which cannot for all times be overlooked without incurring some repercussion.

Stacks are easily built with chopped material after a little experience, and the final product is at least as good as the best made by older methods. Feeding out is greatly simplified and made much easier. Grassland harrowing is not obstructed as it sometimes is by an accumulation of long silage frequently left by stock, for any left-over chopped material is readily and evenly spread with the lightest harrow.

This season Mr. Dibley intends to pit a proportion of his silage to see whether a still better product can thus be made and whether that will cheapen the process. He is not, however, in favour of an extensive system of pits all over the farm (most of his paddocks are between 5 and 6 acres in area and hedged with barberry), but at present considers there might be a place for an odd pit or two together with a preponderance of stacks.

Upper right—Feeding out of chopped silage is as simple as the making of it with a forage harvester. No cutting is required and no heavy slabs of silage have to be struggled with at the end of a fork. Middle right—An opened-up stack made with the forage harvester. The material was excellent, the percentage of waste being very small. Succulent red and white clover and ryegrass comprised the bulk of herbage ensiled. Lower right—Good pasture management involves among other things frequent and thorough harrowing. No difficulty is ever experienced in distributing evenly the accumulated waste from silage feeding when dealing with the chopped material from a forage harvester.

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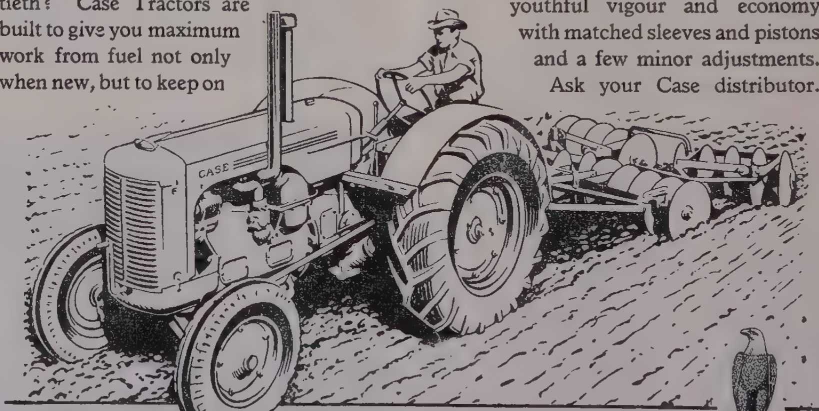

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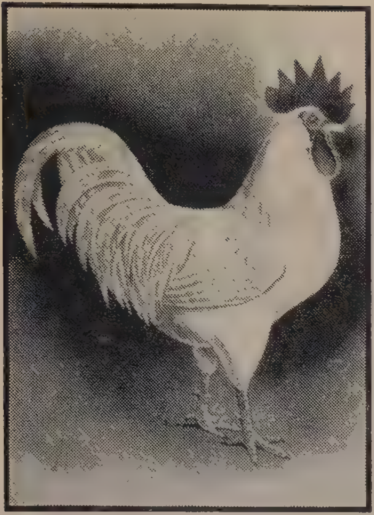


ALTHOUGH in commercial poultry keeping the production of eggs and table birds is the first consideration, commercial producers should not lose sight of the fact that birds should measure up to a reasonable standard for breed type. Showing poultry is a most interesting aspect of poultry keeping and establishes a good standard of type in a breeder's mind, which will be reflected to advantage in his stock, selection and culling being to a higher standard as a result of study of the show points of the breed kept. H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings, reviews in this article points in showing utility poultry breeds and describes the preparation of birds for the show bench.

FOR years the exhibiting of live poultry at shows in New Zealand has created considerable competition and public interest. The great number of varieties which have been created and the skill displayed in breeding them to a state near perfection are a tribute to fanciers, past and present.

Many varieties which were shown 30 years ago are now seen only in small numbers. Black Minorcas, Brown Leghorns, Silver Wyandottes, and Hamburghs have given way to utility breeds such as White Leghorns, Black Australorps, and Rhode Island Reds. These three breeds practically monopolise the show bench in New Zealand today. Possibly the high cost of feed has influenced many breeders to retain only those breeds which are economic.

Hatching Times

Most poultry shows in New Zealand are held in June and July. Consequently, if a bird is to be exhibited in first-class condition, it is necessary to hatch the chickens in time to suit the show selected. White Leghorns, for instance, which are to be shown in June should not be hatched too early; late September or early October will be found quite suitable. Rhode Island Reds, because of their slow maturity, will require to be hatched a month earlier. Where it is intended to exhibit at a number of shows spread over 2 months more than one batch of chickens will be necessary.

Poultry lose condition if they are exhibited continuously, so that many potential winners have been "passed" through being out of condition. By raising several batches of chickens a breeder is able to select a new bird from time to time, giving his bird an advantage over those which have travelled excessively.

Feeding

The feeding of birds for exhibition differs little if at all from the system adopted on commercial farms. The inclusion of 2 per cent. of linseed meal in the mash will impart a sheen to the feathers and 2 tablespoons of Epsom-salt to 1 gallon of water given once a month will prove a tonic. Too much protein should be avoided. A hot, poorly ventilated house will induce light varieties to grow excessive combs which in male birds may have a tendency to lop over.

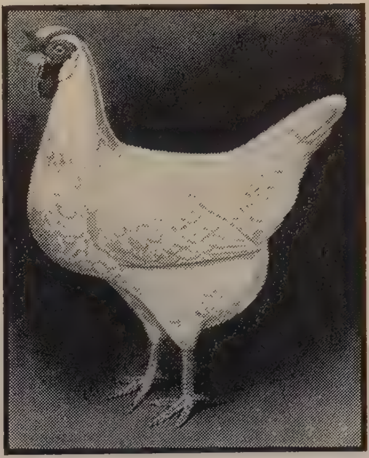
Selection

The selection of a bird suitable for exhibition is to the novice a tedious and exacting business, as all birds look alike, and in exasperation he chooses the first bird which has a bright red comb and appears to be laying.

The following points may be of help to beginners selecting birds for showing. Type should be the first consideration.

White Leghorns

White Leghorns should have a reasonably long back with the tail carried at 45 degrees. The body should be deep, oblong, and wedge-like and the abdomen must be full with plenty of space between the breast bone and pelvic bones. The breast of the bird should be full and not cut away as is common in many birds exhibited. The comb of the female should fall to either side of the face, but must not obstruct the sight in any way. A bird with this fault is usually referred to as being blind and will lose points. The lobes on the face must be white and the eye should be red or orange. Serious defects in any breed are side-sprigs on the comb, feathers on the shanks or feet, a badly bent breast bone, and white in the face. The comb of the male bird must be perfectly straight, free of thumb marks, and must contain five spikes. A Leghorn hen should weigh 5lb. to 6lb. and the ideal cockerel is 6lb. to 7lb.



The ideal male and female White Leghorns are shown at left and above.

Australorps

The Australorp is an Australian modification of the Orpington. It is a

Glossary of Terms

Condition: The general health of a bird, which reflects on the brightness of the comb and feathers. Birds out of condition have little chance of success on the show bench.

Cushion: An excess of feathers covering the base of the tail on the back of a hen and considered a fault in Rhode Island Reds, White Leghorns, and most light breeds.

Dubbing: The removing of the entire comb and wattles on a bird. This is claimed to improve the fertility and stamina of cockerels and is done extensively on commercial establishments.

Ear lobes: The two coloured patches of skin on each side of a bird's face and situated under the ear. The colours vary according to breeds. Leghorns have white lobes and Rhode Island Reds and Australorps red ones.

Gipsy face: The skin of the face is a dark purple and the face is covered with dark hairs. This is a fault in most breeds and is prevalent in Australorps.

Hackles: The feathers covering the neck of a fowl.

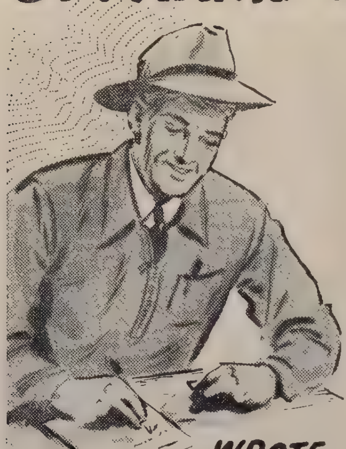
Hock: The joint between the thigh and the shank; often referred to as the knee.

Sickles: The long, curved feathers of a cock's tail.

Squirrel tail: A tail which bends sharply over the back and nearly touches the head. This is a serious defect in most breeds.

Wry tail: A tail carried to one side and not in line with the body of the fowl.

81 FARMERS



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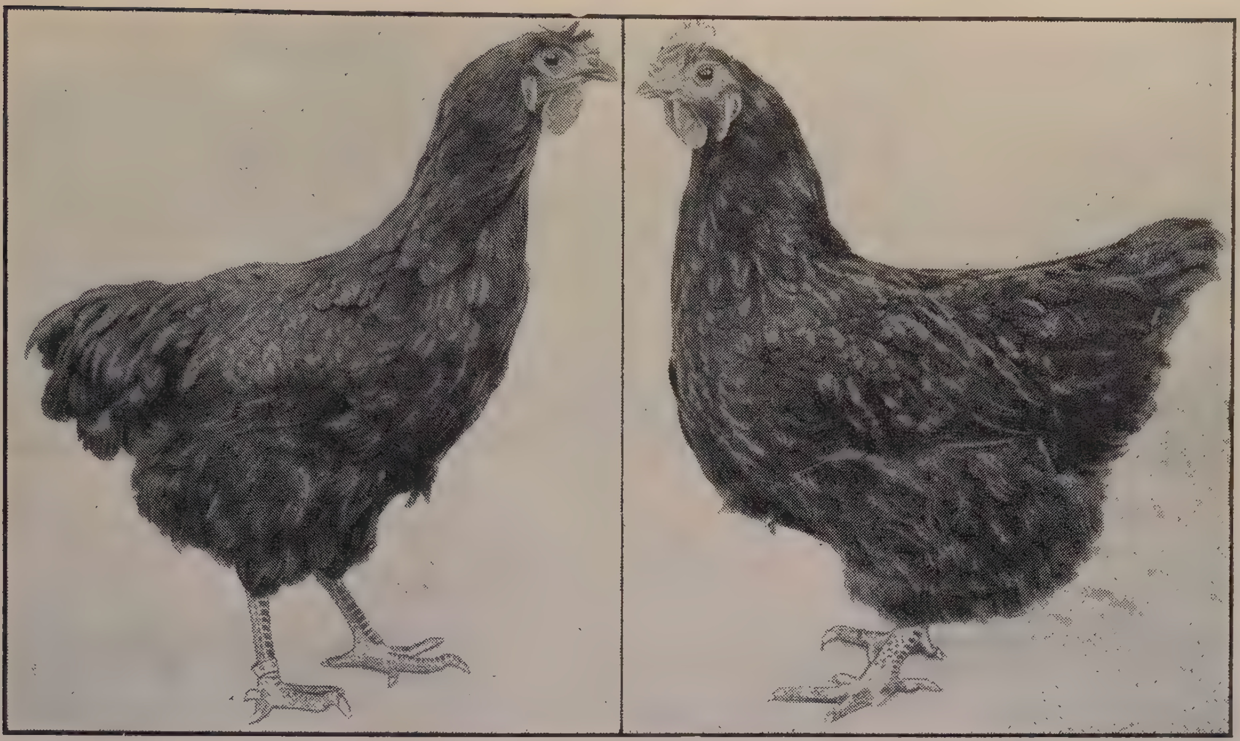


[*Russell Orr photos.*

Left—An Australorp pullet of poor type, with cut-away front and lopped comb. Right—An Australorp hen, showing excellent type.

first-class dual-purpose fowl and rivals the White Leghorn in New Zealand as the main commercial breed. The popularity of the Australorp on the show bench has increased rapidly over the last 10 years, resulting in its becoming one of the largest single breed exhibits at metropolitan shows. Type, which is paramount when selecting Australorps for show, must conform to that laid down by the New Zealand Utility Standards. The body should be deep and wide, tightly feathered, and with the tail carried reasonably low. The face should be smooth, free from wrinkles, and without any tendency to overhanging eyebrows. Ear lobes should be small and completely red and the eyes must be full, bold, and black.

The Australorp is a utility breed and as such should handle like a potential layer. The pelvic bones must be pliable and free of fat or gristle and the abdomen soft and silky. Serious defects are feathers on legs or feet, white in ear lobes, side-sprigs on the the comb, and light or poorly coloured eyes. A bird with a sickle feather missing or a slightly bent breast bone will not be disqualified, but unless the class is particularly weak, will have little chance of success. The illustration at right on this page is of a first-class New Zealand Australorp capable of winning in any company. The correct weight for an Australorp pullet is 5½lb. to 7lb. and of a hen 6½lb. to 8lb.; a cockerel should be at least 7lb. and a cock bird 8lb. to 9lb.

Preparation

The ability to bench a bird in perfect show condition requires experience and perseverance. Otherwise good birds are often ruined by failure of the exhibitor to train and prepare them. Leghorns and other white varieties should be washed a few days before showing. All yellow-legged varieties should have the dirt removed from under the scales. This is a tedious job, but it may mean the difference between success and defeat.

A nervous fowl cannot be expected to give of its best when taken direct from a large flock and deposited in a small pen in a strange building. A number of pens 2ft. 6in. square built on the wall of a convenient shed will prove satisfactory for training. A short piece of dowelling or bamboo can be used to train a bird to stand correctly.

Washing

Washing to the novice is an operation which may appear difficult, but after practising on a couple of birds not intended for showing he can become adept at it.

The materials necessary for washing poultry consist of two or three tubs, plenty of warm water, soap, and towels. After the soap is thoroughly dissolved in the water of the first tub the bird should be immersed and thoroughly soaked. At the same time the feathers should be cleaned with a piece of very soft towelling. Care should be taken not to rub the feathers the wrong way or damage the sickle feathers in the tail. The birds should now be rinsed in warm water in the second tub, in which there should be an abundance of water. Finally the bird is immersed in a tub containing luke-warm water to remove the last traces of soap. All the water should be stroked out of the feathers and they should be dried off with clean towels. The bird, now perfectly clean, can be placed on clean straw in a coop and left to dry. The bird should not be put too close to an open fire or left exposed to severe sunlight, as this may result in the feathers curling. The comb, face, and wattles should also be cleaned; a little olive oil can be rubbed in if required.

Though it is not necessary to wash coloured birds such as Rhode Island Reds, Barred Rocks, and Australorps, it is advisable to wipe them over with a piece of silk for a few days before showing them. If they are confined to a pen away from bright sunlight, not only will their natural colour be preserved but a sheen will be imparted to the feathers.

Birds that are to be railed to distant shows must be sent in a box permitting them adequate room. A light box 3ft. long, 1ft. 6in. high, and 1ft. 6in. deep and divided into three sections will provide adequate room for three fowls of any breed. Chopped straw or chaff can be used for bedding, but water tins should not be included unless the distance of travel is particularly long. The water soon gets spilt and the birds are on wet litter for perhaps most of the journey.

On arrival the birds are provided with food and water by the show secretary.

Care of Livestock during May

Contributed by the Animal Research Division

AUTUMN-SAVED PASTURE

IN most districts there is still time to provide good winter grazing by shutting up paddocks and letting them grow during autumn and early winter. Having some pasture cover on paddocks before the first frosts will assist pasture growth during winter. Autumn-saved pasture is invaluable for early-calving cows. It also provides the best insurance against sleepy sickness in ewes. If necessary, silage should be fed to cows now to enable some paddocks to be shut up. Once the ewes have been tupped they are all the better for being done fairly hard until 3 or 4 weeks before lambing. This also will enable some paddocks to be spelled.

BLOOD POISONING IN HOGGETS

Blood poisoning in hoggets grazing on turnips is becoming an increasingly important problem. Deaths occur from infection with the blackleg organism, which probably gains entry through the mouth. An excellent vaccine, which confers very good immunity, is now available for purchase in New Zealand. On properties where losses have previously been experienced, hoggets should be vaccinated a fortnight before they are placed on turnips. The nearest Veterinarian or Livestock Instructor should be consulted concerning the method of vaccination.

UNTHRIFTY CALVES

The best feed for calves is good, fresh pasture, and this can be provided by rotating the calves through the cow paddocks. Good-quality hay is necessary to supplement the sappy young autumn pasture. At the first sign of unthriftiness calves should be drenched with phenothiazine, being given the full dose recommended on the label. Drenching, however, will not be effective unless the calves are properly fed.

RED WORMS IN HORSES

Red worms can seriously reduce the efficiency of working horses, and are responsible for many deaths in foals. Phenothiazine is a very effective remedy, but is best given under veterinary supervision, as, in certain conditions, it may prove dangerous. Animals should be treated before winter.

INOCULATION OF DOGS AGAINST DISTEMPER

Distemper in dogs can in a very high percentage of cases be prevented by vaccination. This is best done when the pups are 3 to 4 months old. The virus has a short life, and it is therefore necessary to notify the Veterinarian at least a month before the pups are to be vaccinated.

Provision for winter grazing should be made now by closing paddocks for autumn-saved pasture. If necessary, silage should be fed to cows now to enable some paddocks to be shut up.

MILKING MACHINE OVERHAUL

As soon as the cows have been dried off arrangements should be made for the milking machine to be overhauled by an expert. Do not install complicated gadgets, but make sure that all parts of the machine are working efficiently. This will not only ensure rapid, trouble-free milking, but is likely to increase production, and will help to reduce mastitis. The Department of Agriculture's Bulletin No. 260 "Mechanical Milking" should be carefully studied by every dairy farmer.

PREVENTION OF SUCKING BY CALVES

Sucking of each other by calves is a habit which should be broken as soon as it is detected. The insertion of a bull ring is effective in most cases.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during February and for the 7 months ended 28 February 1953, with comparative figures for the same month and 7-monthly period of 1951-52, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Tons Creamery	Whey	Total	Percentage Inc. or dec.
February 1953	16,846	337	17,183	—
February 1952	16,920	296	17,216	—
Increase or decrease ..	—74	+41	—33	—0.191
7 months ended 28/2/53	132,974	2,418	135,392	—
7 months ended 29/2/52	128,539	2,111	130,650	—
Increase or decrease ..	+4,435	+307	+4,742	+3.629

Butter in store at 28 February 1953 was 28,182 tons

CHEESE

Period	Tons White	Coloured	Total	Percentage Inc. or dec.
February 1953	11,320	30	11,350	—
February 1952	10,871	—	10,871	—
Increase or decrease ..	+449	+30	+479	+4.406
7 months ended 28/2/53	77,261	109	77,370	—
7 months ended 29/2/52	69,894	519	70,413	—
Increase or decrease ..	+7,367	—410	+6,957	+9.880

Cheese in store at 28 February 1953 was 20,866 tons

If these figures are converted into butterfat equivalent, there is an increase of 4.686 per cent. in butterfat graded for the 7 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Wintering Dairy Herds and Planning Crop Rotations

Seasonal Notes by the Extension Division

SUCCESSFUL feeding of a dairy herd in early spring depends on carefully planned autumn and winter supplementary feeding and pasture management. Late-autumn supplementary feeding should start before grass growth declines to a low level so that fields may be closed in rotation and feed saved for winter and spring feeding. It is little use closing fields after the whole farm has been closely grazed in early winter; closing must be done while growing conditions are still favourable. If growth on early-closed fields becomes too rank, the paddocks should be quickly and leniently grazed down and closed again.

RUN-OFFS

THE run-off system, though it allows winter spelling of the home farm, does not eliminate the need for adequate winter feeding of the dairy herd. Many run-offs consist of poor and only partially developed hill country with danthonia and browntop pastures invaded by scrub, and cows turned out on such pastures generally receive inadequate amounts of supplementary feed. Poor feeding when cows are dry may result in a loss of up to 60lb. of butterfat per cow in the following season. An adequate daily ration for a dairy cow for at least 6 weeks before calving consists of about 6lb. of hay, 20lb. of silage, and about 2 hours' grazing on autumn-saved pasture. Where run-offs are necessary steps should be taken to see that the cows are adequately fed while on the run-off. The run-off system is common on flat, heavy dairying land and is practised to avoid pugging the pastures during winter. Pugging is not eliminated, however, for cows have to be back on the home farm in July or August. Much can be done to improve the winter carrying capacity of flat, heavy land by thorough drainage, subdivision, provision of concrete strip access paths, and rotational grazing.

—*C. E. BALLINGER*

* * *

WINTER GRAZING AND WINTER SPELLING

WINTER-SPELLED pastures often show an increase in undesirable grasses such as Yorkshire fog and a suppression of clovers the following spring, and winter-grazed pastures usually show white clover dominance. It is a good plan to alternate the parts of the farm devoted to winter spelling and winter grazing. Winter grazing and feeding out on pastures spelled the previous winter not only suppress Yorkshire fog and encourage clovers, but also help the pasture to regain full vigour through the concentration of stock manure. After concentrated winter feeding chain harrowing of the pastures to spread fibrous droppings is essential.

—*R. B. GORDON*

* * *

CROP ROTATIONS

IN arable farming the planning of crop rotations requires careful consideration. The main factors are: The building up of soil fertility, the fodder requirements of livestock, the choice of annual cash crops (often dependent on trade requirements), and as even a distribution of labour and tractor power as possible throughout the year. Pastures and leguminous crops such as peas provide the build-up in soil fertility, and the basis of a rising level of fertility is the improvement of pasture production. The rotation should provide for pasture establishment under the best possible conditions and the breaking up of pastures before the swards have deteriorated and fertility has declined. No single rotation will meet all circumstances, and many sequences of crops can be evolved to suit varying soil, climatic, and trade requirements. Examples in the table show soundly planned rotations serving the dual purpose of safeguarding soil fertility and maintaining or improving crop yields and livestock production with maximum use of the land. They would apply more especially to mixed (arable/fat-lamb) farming land on a medium soil type in Canterbury. All begin out of grass and after winter fallow.

Rotation	1st year	2nd year	3rd year	4th year
A	Chou moellier and/or turnips, swedes, rape (with restricted areas in peas or potatoes)	Wheat (followed by catch-crop green cereal or fallow)	Oats or barley	Grass 4 years
B				
1.	Chou moellier or turnips	Potatoes	Oats (followed by catch-crop green cereal or fallow)	Grass 4 years
2.	Peas	Wheat	Barley and/or rape (followed by catch-crop greenfeed or fallow)	Grass 4 years
C*	Potatoes	Wheat	Chou moellier and/or rape, turnips, lupins	Oats or barley

* Peas or linseed could be substituted for part of the fodder crop area in the third year or the rotation could be lengthened a year to include these crops. Grass to remain down up to 6 years could be sown with oats in spring or after a catch-crop green cereal and summer fallow the following season.

In rotation A wheat and oats are the most extensive cash crops. The acreages of peas and potatoes are more restricted, and the crops are grown in the same fields and at the same time as chou moellier/turnip and rape respectively. After wheat there is the alternative of (a) growing autumn-sown greenfeed (or using wheat stubble grazing), followed by summer fallow before grassing down or (b) autumn sowing oats or barley for greenfeed and grain and omitting the summer fallow before regrassing.

Rotation B, which is virtually two rotations used simultaneously, includes the same crops but with less disproportionate acreages between crops and with each crop confined to a separate field. Both A and B allow 4 years under pasture; the first season for grass seed, the second for clover seed, and then 2 years' grazing.

C is a longer rotation, allowing 5 to 6 years under pasture, according to the alternative adopted after oats/barley and before resowing to pasture. All rotations provide a balanced sequence of exhaustive and restorative crops, cater for both summer and winter/early-spring forage, and include reliable cash crops. Farm production is diversified, yet the plan is flexible and permits some variation in the proportional acreage of each crop or use of alternative crops. Full use is made of the land, cultivations and sowing can be timely, and the harvests are spread.

—*D. J. DAVIES*

* * *

WINTER FALLOW

IN the low-rainfall, arable farming districts of the South Island the winter fallow is important in seed-bed preparation for root and forage crops sown in spring and early summer. Early working allows ample time for efficient weathering of the soil, and work should begin, if possible, not later than April. Areas out of grass should be skim ploughed (a prior cut with discs or grubber may be given where turf is matted) and after several weeks in the furrow should be disced and hustled in late autumn preparatory to deep ploughing in June. The land then lies in the furrow until spring (September), when further working with hustler and harrows controls weeds and achieves the desired fine, deep tilth. Where the initial ploughing cannot begin until late May or June the turf is either deep ploughed and fallowed in the furrow until spring or skim-ploughed with the object of deep ploughing in September. For a winter fallow after autumn-harvested crops the stubble may be deep ploughed in April or May and subsequently worked with the hustler whenever opportunities are favourable or, on the more friable soil type, discing and hustling may replace use of the plough.

—*J. L. SYMONS*

Expansion of Soil Advisory Service

By D. F. WATERS, Senior Agricultural Chemist, Department of Agriculture Soil Research Station, Rukuhia

IT is one of the duties of Instructors in Agriculture to advise farmers on soil fertility problems. As the basis for their advice they use their knowledge of local soils and farm practices, the results of local experiments, and examination of pasture swards or crops, often aided by quick-test soil analysis. The number of soil samples taken for advisory purposes is increasing rapidly each year and has now reached about 8000 a year.

AFTER representations from Federated Farmers, the Minister of Agriculture recently approved an expansion of the service and a scale of fees. Charges are £1 per sample, or when more than four samples are desired a basic charge of £4 for a farm visit and the collection and analysis of four samples, plus 10s. for each additional sample. Under the soil advisory service, samples are collected by the local Instructor, who at the same time makes the necessary assessment of type, fertiliser history, and pasture sward or crop condition. When the soil test results are received he is then able to correlate the tests with the other information he has collected and consider them in relation to the fertility standard of the soil type concerned, and finally advise on fertiliser treatment.

Quick Tests

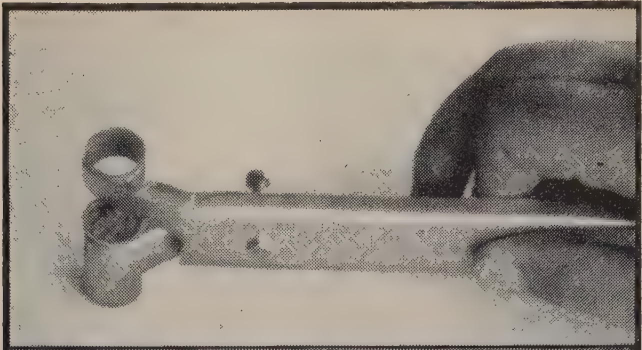
Soil chemistry is far from simple, but it is possible by analysis to find out a soil's content and requirements of lime and the major plant nutrients—phosphorus, potassium, and calcium. Standard methods of analysis are accurate, but slow and expensive; therefore they are practicable only for research purposes where small numbers of samples are taken.

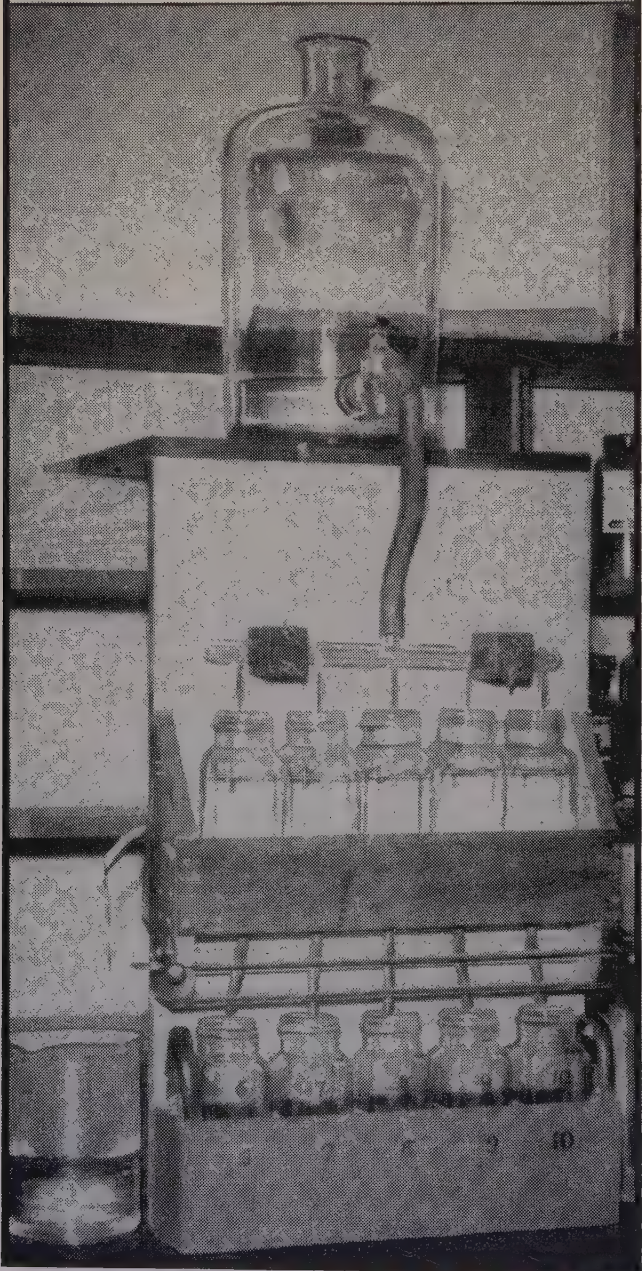
Topdressing cannot normally influence the fertility of more than the top 3in. of soil under permanent pasture and soil samples for grassland need to be taken only to this depth. The weight of soil to 3in. depth over an acre is roughly 650,000lb. or about 300 tons. A pound sample of soil is a very small portion of a paddock, so the sample must be carefully taken by an officer equipped to take small borings from many parts of a field. The reliability of samples taken by different workers using a correct procedure has been checked. The results more than satisfied requirements for advisory purposes and showed such samples to be a sound basis for advice.

In the laboratory samples are dried in a current of warm, dry air and are then crushed and sieved to remove stones and roots. All tests are made on measured volumes of soil. This method is rapid and sound, as the information sought is the ability of a certain volume of soil to provide the necessary plant foods rather than what a certain weight of soil will supply. A measure (Fig. 1) invented in the laboratory is used to scoop up the soil which is lightly packed by tapping. The excess soil is then swept off by squeezing the handles and a definite measure of soil is left to be tipped into the container for analysis.

Phosphate

Available phosphate is measured by using very dilute acid to extract the phosphate. This is the most reliable method tested, but it is relatively slow, taking an hour. Speed is gained by equipment designed to handle 20 samples in each batch. The measured volumes of soil are transferred to bottles and the acid used for extracting the phosphate is added to 5 bottles at a time (Fig. 2), and 20 are capped and shaken in the one operation (Fig. 3). After 30 minutes' shaking the extracts are tipped from racks 10 at a time into funnels prepared with filter papers (Fig. 4). Reagents added to a measured portion of filtrate produce a blue colour, the depth of blue being in proportion to the phosphate present. This colour intensity is measured by passing a beam of orange-red light through the solution on to a photo-cell. Deep blue solutions pass less of the orange-red light and the photo-cell gives a lower





Upper left (Fig. 1)—A soil measure. By squeezing the handles a definite measure of soil is obtained. Lower left (Fig. 2)—The acid for extracting the phosphate is added to 5 bottles at a time.

reading on the scale of a galvanometer.

Calcium and Potassium

A quick extraction method is used for calcium and potassium. Nine samples are treated in a batch (Fig. 5), but the shaking lasts only a minute. After the extract is filtered calcium and potassium are measured by a flame photometer. This is essentially a special oxy-acetylene burner which draws up and sprays extract into the flame. At the extremely high temperature calcium tinges the flame with brick red in proportion to the amount of calcium present. A photo-cell screened to admit only red light gives a galvanometer reading and so measures the calcium present. At the same time a second screened photo-cell records potassium present by the infra-red light emitted.

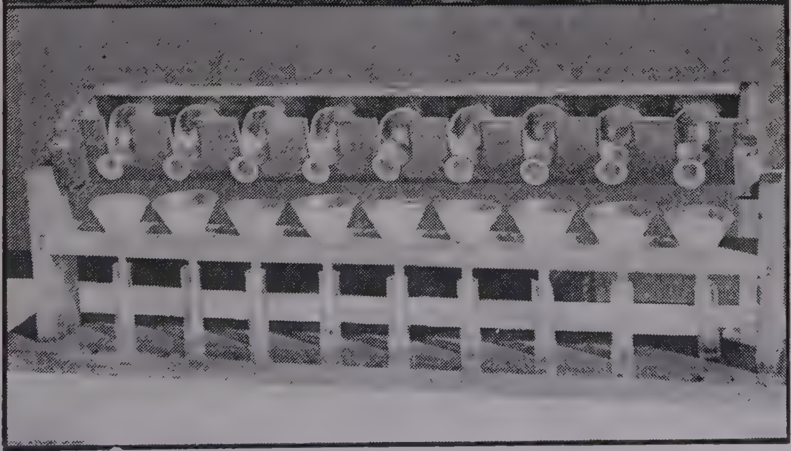
The test for calcium will determine whether it is necessary to add lime to provide calcium as a nutrient for good plant growth. However, before liming recommendations can be made it must be determined whether liming is needed to correct soil acidity

pH Test

The degree of acidity or pH of a soil is measured in the laboratory by a pH meter. Measured volumes of soil and distilled water are mixed and left to stand overnight. Two electrodes are placed in this soil-water suspension and the minute electric potential generated is amplified and measured directly in pH units. On the basis of the acidity of the soil, the soil type, and the amount of calcium present, a fair recommendation can be made as to the lime requirement of the soil. The extreme fluctuations which occur in in some unusual Australian soils have not been found in New Zealand farmland. By duplicate sampling and by sampling over a period it has been proved that consistent results are obtained by the methods used here.

Soil Fertility

Soil fertility is transitory and fertiliser is only one aspect of soil fertility improvement or maintenance. Grazing management for pastures and crop rotation practices for annual crops are equally important factors. Soil tests provide the Instructor with definite data which he can assess in relation to other relevant facts, enabling him to advise with more confidence on topdressing and pasture management or on fertilisers for annual crops and changes of rotations



Upper right (Fig. 3)—Twenty bottles containing measured volumes of soil and the acid used for extracting the phosphate are capped and shaken in the one operation. Middle right (Fig. 4)—After 30 minutes' shaking the extracts are tipped from the racks 10 at a time into funnels prepared with filter papers. Lower right (Fig. 5)—A quick extraction method used for calcium and potassium. Nine samples are treated in one batch, but the shaking lasts only a minute.

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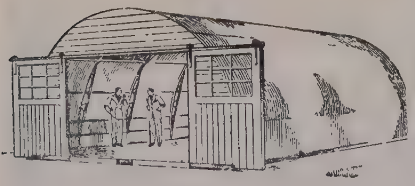

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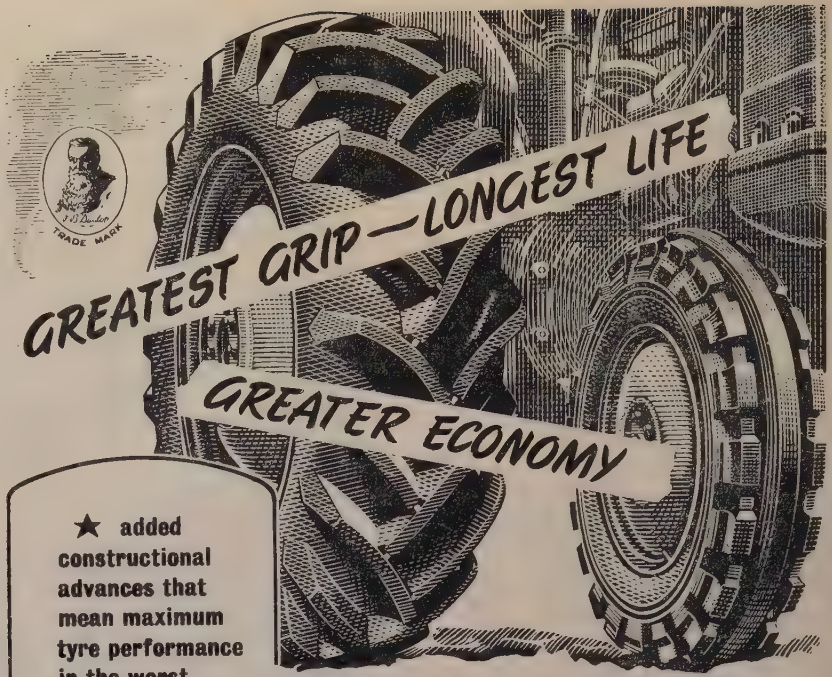

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Establishment and Maintenance of Ornamental Lawns in the Home Garden

FEW gardens are complete without a lawn, yet only an even sward that is perennially green enhances the appearance of the house and its surroundings. The lawn needs to be sown on a well-prepared soil and subsequently given regular and careful treatment. In this article W. D. Alchin, Horticultural Instructor, Department of Agriculture, Auckland, outlines the methods and practices of successful lawn sowing and maintenance.

IN the preparation of an area for the establishment of a lawn the objects are to rid the soil of weed seeds, to consolidate the soil, and to level the area. First-class lawns can be produced only by thorough preparation, as hastily prepared lawns will lead to weedy, uneven surfaces, which are hard to correct later.

The ideal method of preparing the ground for a lawn is to dig and level the area in spring and allow it to lie fallow until autumn. During this period the soil is given frequent shallow cultivations to kill weed seedlings that germinate and thus steadily reduce the weed population of the seed-bed. With the area left bare for this time the ground is given ample chance to consolidate and form a firm seed-bed.

However, very often it is not desirable to have the selected area left bare for so long; not only does it look unsightly, but it is unproductive. Therefore it may be decided to grow a crop of vegetables on the area during the preparatory period. Several factors should then be considered so that the area may be given as thorough a preparation as it warrants. A crop should be chosen that can be removed at least 6 weeks before the lawn is sown; it should be shallow rooted and should not require moulding. Mulches should not be used, as they discourage germination of weed seeds, and applications of compost or animal manure should not be made, as they are apt to contain extra weed seeds and also encourage worms. It is advisable after the crop is harvested to consolidate the bed by means such as a roller or heavy trampling to speed the natural consolidation.

Potatoes are not the best crop to grow on an area that is being prepared for lawn, because although the cultivation that is necessary does have the desired effect on the weeds, the moulding they require and the digging disturb the lower soil too late in the season.

Only the first spring cultivation needs to be deep. At this stage every effort should be made to work the soil down to an even tilth; all large clods should be broken down and the surface made approximately level. Subsequent cultivation to control weed growth should be shallow, the best tool for this work being the push hoe. All dead weeds should be raked off the area after each cultivation.

Where it is intended to lay down a level lawn on a sloping section, the main levelling should be carried out in spring. The topsoil is first removed and heaped to one side and then the subsoil is levelled. The subsoil from the higher level is skimmed off and placed over the lower level. It is advisable to loosen up the soil on what was the higher level and to firm well the soil that is used for filling the lower level, the idea being that the subsoil under the whole lawn will then be of uniform hardness. If this is not done, the lawn may dry out in summer over the areas where the subsoil is left hard. The topsoil should then be spread evenly over the whole area.

If the summer is dry, the area should be thoroughly watered at frequent intervals. This will help to consolidate the soil and also to germinate weed seeds, the seedlings of which will subsequently be killed by

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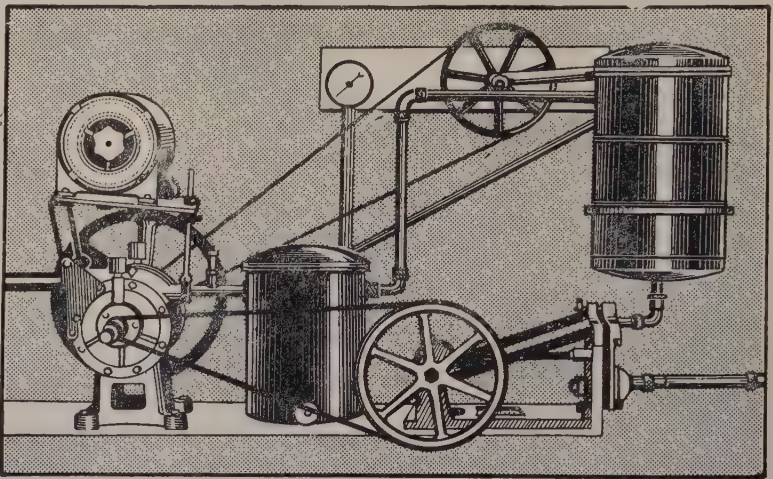

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FORD MOTOR COMPANY OF NEW ZEALAND LIMITED LOWER HUTT hoeing. In a wet summer watering will not be necessary, but consolidation will be poor unless the area is soaked by rain or by hosing.

Final Levelling

By autumn the area should be ready for final levelling and sowing.

The hollows can be filled in and the mounds levelled by dragging a heavy board with a straight edge across the area several times. The surface should then be raked so that it is cultivated to an even depth throughout.

For greater accuracy in levelling, pegs may be driven into the ground. These are then connected by strings which are made level by a spirit level. The soil is then raked even with these strings.

A light rolling to firm the seed-bed can be made after the soil has been levelled, but a roller is a poor leveller, as it tends to accentuate depressions. A rolling will indicate if and where further levelling is required. After this the area should be raked again before sowing.

Sowing

The time to sow seed is governed by climatic factors. For rapid germination the soil needs to be warm and moist, and for proper establishment an adequate supply of water needs to be assured for the first few months.

Such conditions usually prevail in late autumn. If the early winter is dry, the new lawn will require frequent watering until rainfall is adequate.

Spring sowings often fail and become weed infested because the soil is cold when sowing is done and dries before proper establishment of the grass.

The grass mixtures recommended for different types of lawns are:—

1. For fine-textured front and ornamental lawns

Browntop, 1 part by weight
Chewings fescue, 2 parts by weight
Sown at 1oz. of mixture per square yard

2. For coarser lawns such as back lawns, which will be subjected to heavier wear

Chewings fescue, 20 parts by weight
Browntop, 10 parts by weight
Crested dogstail, 5 parts by weight
Yarrow, 1 part by weight
Sown at ¼oz. per square yard

Before seed is sown a fertiliser mixture consisting of equal parts of sulphate of ammonia and "super. compound" should be applied at 1oz. per square yard. The grass seed is then broadcast and a light raking is given.

To facilitate even sowing the following method can be adopted:—

The total amount of seed is divided into four lots. The first lot is broadcast in one direction over the entire surface; the next lot is sown at right angles to the first sowing; and the next two lots are sown on the diagonals across the surface.

A cast of more than 6ft. should not be attempted when sowing seed or manure. The lawn can be divided into lanes by strings spaced at 5 to 6ft. intervals to facilitate this work.

Treatment after Sowing

The first cut of a new lawn should be made when the grass is 1½ to 2in. high with a sharp mower set high. This will generally be 4 to 6 weeks after sowing. Too close cutting at this stage will tend to pull the young seedlings from the soil. A young lawn should not be cut when the soil is soft and wet.

Grass seedlings may show a tendency to yellow in the early stages of growth. If this should happen, a dressing of sulphate of ammonia at ½oz. per square yard should be applied and repeated later if necessary. This can be either watered on to the grass or broadcast. If it is broadcast, it should be mixed with soil to obtain an even distribution.

Maintenance of Established Lawns

A good, well-found lawn requires only a few routine operations to keep it growing in the best condition.

These operations are aimed at maintaining a dense, close turf of thrifty grasses that is not easily invaded by weeds. The grasses are stimulated by regular dressings of fertilisers and once a year the surface is raked and fresh topsoil added.

Fertilisers

The fertiliser mixture recommended is made up of 3 parts of sulphate of ammonia to 1 part of "super. compound" to be applied at 1oz. to the square yard at 3-monthly intervals beginning in March.

Not only does this mixture encourage the grasses, but it has a twofold action on the weeds. First, the very soluble sulphate of ammonia has a burning effect on the broad, flat leaves of the weeds. For this reason the dressing is usually broadcast on a sunny morning when the dew is still on the lawn and there is a prospect of the day remaining hot and dry. This produces the maximum burning effect on the weed foliage; the more upright, shiny grass leaves are less affected.

The second effect is the gradual increase in soil acidity brought about by the sulphate of ammonia. As grasses are able to withstand more acid soil conditions than weeds, they will flourish in a soil that is unsuitable for weed growth.

Renovation

The surface of the lawn should be raked early each winter. A rake that has had its teeth filed to fine points is the best implement for this.

The rake is dragged over the lawn in one direction only to make cuts about 1½in. deep. If a weight, such as a bag of soil, is tied over the head of the rake, full penetration may be made more easily.

After this a dressing of fresh topsoil is applied to the surface at one-sixth of a cubic foot to 1 sq. yd. The lawn

Flower beds and trees set in the lawn can look attractive, but they increase the time spent on lawn maintenance. The space between the beds should be greater than the width of the mower.

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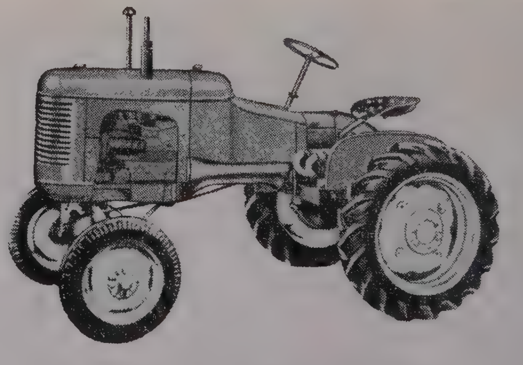

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should then be brushed with a stiff broom to distribute the new soil.

When seed is to be sown it is mixed with this new soil before it is spread. The texture of the soil that is added should resemble that of the lawn as closely as possible. Dissimilar soil types do not consolidate well and can produce unfavourable conditions for root growth that lead to patchiness of the turf.

Spiking

On a surface that has become unduly compacted it is often advisable to treat it with a special corer instead of raking. An alternative method is to spike the lawn with a garden fork, care being taken in withdrawing the fork to do so without any levering or lateral action which would break the surface. The holes should be made 2 to 3in. apart and about 6in. deep. This improves aeration and drainage of the soil.

Relevelling

Depressions in the surface are filled in during relevelling. Where there are shallow depressions the surface is raked or spiked as for the rest of the lawn and new topsoil is added a little more heavily to these spots and then firmed. If the grasses have not been buried too deeply, there should be no need to resow these areas. Deeper depressions can be either gradually filled by this method over several years or one of the following two methods can be used.

The first method is to remove the turf from the depression and then fill in the hollow with sifted soil, firm it, and then replace the turfs and water the area. If this is carefully done, the turf soon knits and there is not the patchiness that can be caused by new grass seedlings. By the second method the old grass can be skimmed off at the roots with a spade and the bare surface of the depression raked before filling with new soil. This new soil is then firmed and resown.

The reason for removing the old grass in the second method is that the new soil will then incorporate with the old soil more readily.

Mowing

Lawns should be cut regularly during the growing season. The aim should be to keep the grass at about 1in. high and never to let it grow to more than 2in.

Too close cutting, particularly during winter, will open up the sward and encourage moss. If the lawn is allowed to get too long, the finer grasses like browntop die out from shading.

The recommended practice is to catch the lawn clippings in a catcher and remove them from the lawn. When the clippings are allowed to fall on the lawn the finer grasses are smothered. If the soil has been made acid by the 3 : 1 fertiliser mixture given earlier, these clippings will be slow to decompose and will cause an unduly thick layer of peaty material to be formed.

The mower should be well oiled and run freely, particularly in wet weather, when stiffness in the machine is liable to result in breaking of the soft surface of the lawn.

The sulphate of ammonia and "super. compound" mixture given also has an effect on the texture of the soil. It causes a heavy clay to become more friable. This improves the drainage and the bearing surface, thus enabling the grass to be cut sooner after rain because there is less likelihood of the surface being broken by the mower wheels.

Watering

To maintain lawns satisfactorily during very dry weather it is necessary to water regularly. The most satisfactory way of watering lawns is with a sprinkler, but if this method is not possible, flooding may be practised. Whatever method is used, the lawn should be given sufficient water to wet the soil below the full depth of the roots.

Weed Control

When a lawn bed has been thoroughly prepared and the grasses have been well fertilised and are growing strongly there should be little trouble from weeds.

Individual weeds which persistently withstand treatment can either be grubbed out or a pinch of sulphate of ammonia can be placed in the crowns.

If weeds are very prolific, the use of a mixture of 3 parts of sulphate of ammonia to 1 of sulphate of iron at 1oz. to the square yard is more effective than the sulphate of ammonia and "super. compound" mixture. It may be necessary to repeat this treatment, but it should not be re-applied until the grasses have recovered from the temporary burning they will probably suffer.

Control of Weeds with Hormones

Hormone sprays should be used only as a last resource on lawns which have become completely weed infested. As there is a danger of their causing damage to other horticultural plants nearby, full information on their use should be obtained from the local Horticultural Instructor in the district. (See also "Journal of Agriculture", January 1953, page 47.) Wherever a lawn has become seriously weed infested it will be necessary not only to kill the weeds but to resow the grass and correct the condition which led to weediness.

Pests

Among the most damaging pests on lawns are grass-grubs and porina (*Oxycanus*), which cause a great deal of damage by feeding on the roots of the grasses. Also, their tunnelling activities just below the surface cause the soil to dry out unduly during summer. D.D.T. is used to control these pests, and is applied at ¼oz. of 50 per cent. wettable powder to 10 sq. yds. of lawn. This powder can be either mixed with soil and broadcast or stirred into water and applied as a liquid. If this is followed by rolling, the soil will be reconsolidated and the tunnels filled in.

Flagstones set in the lawn make an attractive pathway. If they are set level with the lawn, the mower can pass over them without damage to the blades.

Because of the valuable effects of worms in pastures and vegetable gardens, it is often thought that they are beneficial in lawns. Their activity, however, is detrimental to lawns. Not only does the presence of many worm castings on the grass detract from the appearance of the lawn, but in their digging worms are constantly bringing up the lower soil and opening up the surface, thus allowing weeds to enter. When moist worm casts are flattened by a mower they smother the grasses, and weeds blowing on to these patches find good conditions for germination and growth. The object of lawn management is to create and maintain an acid, relatively infertile layer of soil that is conducive to growth of grass but not of weeds. Repeated use of sulphate of ammonia has been found gradually to rid lawns of worms.

A more rapid reduction of worms can be obtained by watering the lawn with a solution of copper sulphate. One pound of copper sulphate is dissolved in 50 gallons of water and applied by watering can at ½ gallon per square yard. This should be immediately followed by a further ½ gallon of pure water to the square yard. Excessive or uneven applications of this treatment can cause harm to the lawn.

Another method is to apply the 3 : 1 fertiliser mixture at night. The worms then come into contact with the sulphate of ammonia crystals and this causes a high mortality among them, but then some of the burning effect on the weed foliage is lost.

Although this article is intended to cover the establishment and maintenance of ornamental lawns, the general principles are those followed for bowling greens and playing areas.

The recommendations given here can therefore be used by those who desire to lay down such playing areas in their gardens.

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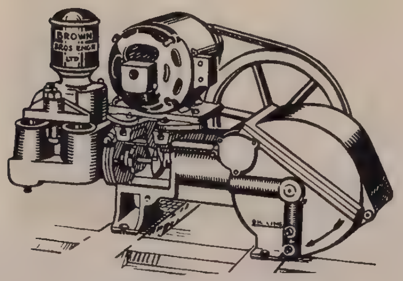

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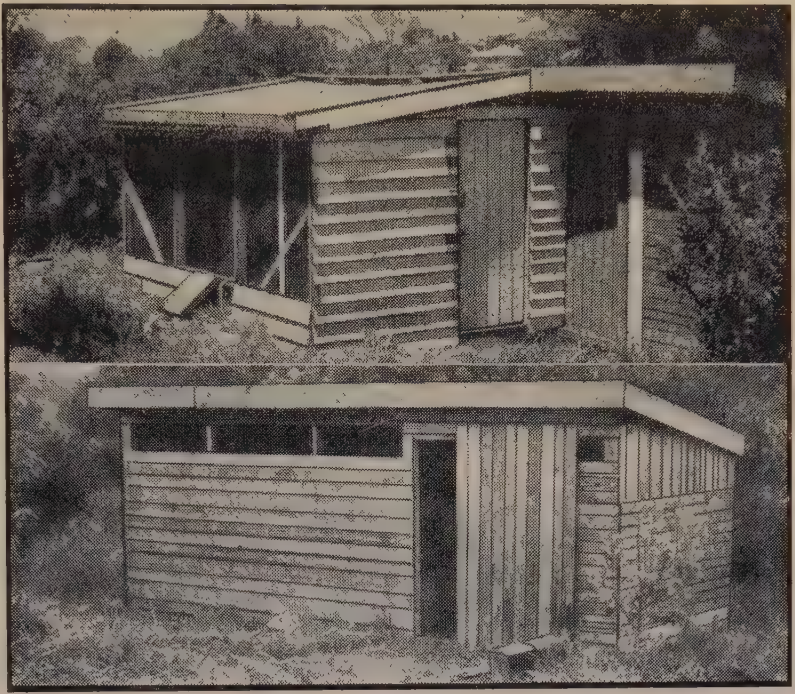
Reconstruction of Poor-type Household Poultry Laying Shed

WHEN properties change hands the new householder sometimes finds a poultry laying shed in the garden. All too frequently such laying sheds are of poor construction and unlikely to give satisfactory results if stocked with laying pullets. In this article S. G. Haddon, Poultry Instructor, Department of Agriculture, Auckland, describes how an inferior laying shed was reconstructed and made into a building that now affords satisfactory conditions for birds. This is the first of two articles describing this household poultry unit. Further details will be given next month.

THE original shed is shown in the illustration on this page and the plan on page 373. The shed was 20ft. long by 8ft. deep and at the most should have housed 40 birds. The original owners, however, were endeavouring to keep 150 birds in it, with most unsatisfactory results. As can be seen in the illustration at right, this lean-to shed had the front boarded up to within 18in. of the roof. Old car cases had been used, and the interior was lined with sisal paper, which was in bad condition. The floor was earth with no litter on it and the nest boxes consisted of a wooden tray some 18in. wide and 4in. deep running the length of the front wall.

The walls themselves were resting on short lengths of 3in. x 2in. timber embedded upright in the earth of the floor. There was thus a gap of 2in. to 6in. round the bottom edges of the back wall and the two side walls. The gap under the front was choked with surface litter washed down from the sloping ground outside the shed. As there was no spouting, all rain-water ran down the walls and kept the interior of the house damp. This dampness was increased by the outside surface drainage seeping into the house.



Upper—Reconstructed household poultry laying shed. Lower—Inferior shed from which it was made.

The conversion of this most unsatisfactory building into an intensive house allowing at least 4 sq. ft. of floor space per bird for about 50 birds was complicated by the need for rigid economy in buying new material, and by the need to make the most of used timber from a dismantled weatherboarded shed. The conversion finally decided on is shown in the plan on page 373. The dimensions fixed on were as follows: Pen, depth 16ft., width 13ft.; store space, depth 8ft., width 7ft. Fifty birds would thus have 208 sq. ft. or over 4 sq. ft. per bird.

The illustration below shows the bottom plates for the extension in position, secured to foundation blocks. Some old corrugated-iron sheets were split lengthwise and let into the ground so that the top edges were level with the tops of the bottom plates.

The height of the front wall was determined by the length of the pieces of 3in. x 2in. available as studs and the existing roof of the original lean-to shed. A consideration of these factors led to the adoption of a 6ft. stud which would allow the use of a gable roof with flat ridge ventilation.

The bottom plates for the extension in position during the reconstruction work.

Reminders for May

Before winter sets in adequate litter should be on the floor of a laying shed. Litter should not be cleaned out or added once the atmosphere becomes moist in winter. Fresh litter picks up the moisture and may become damp. Four to 6in. of litter should be put in the house now.

Where late-hatched pullets are slow in coming into lay or where egg production is not satisfactory a small trough of meat meal should be placed in the laying shed and the pullets allowed access to it. They will not eat too much of this meal and it will act as a stimulant to egg production.

Laying pullets require a shell grit such as oyster shell as a source of lime for forming good egg shells. A shell grit or limestone grit should always be before the pullets.

Pullets also require a supply of hard metal grit as an aid to digestion. If birds are not running outside where stones are available, metal grit should be supplied in a small hopper as well as shell grit.

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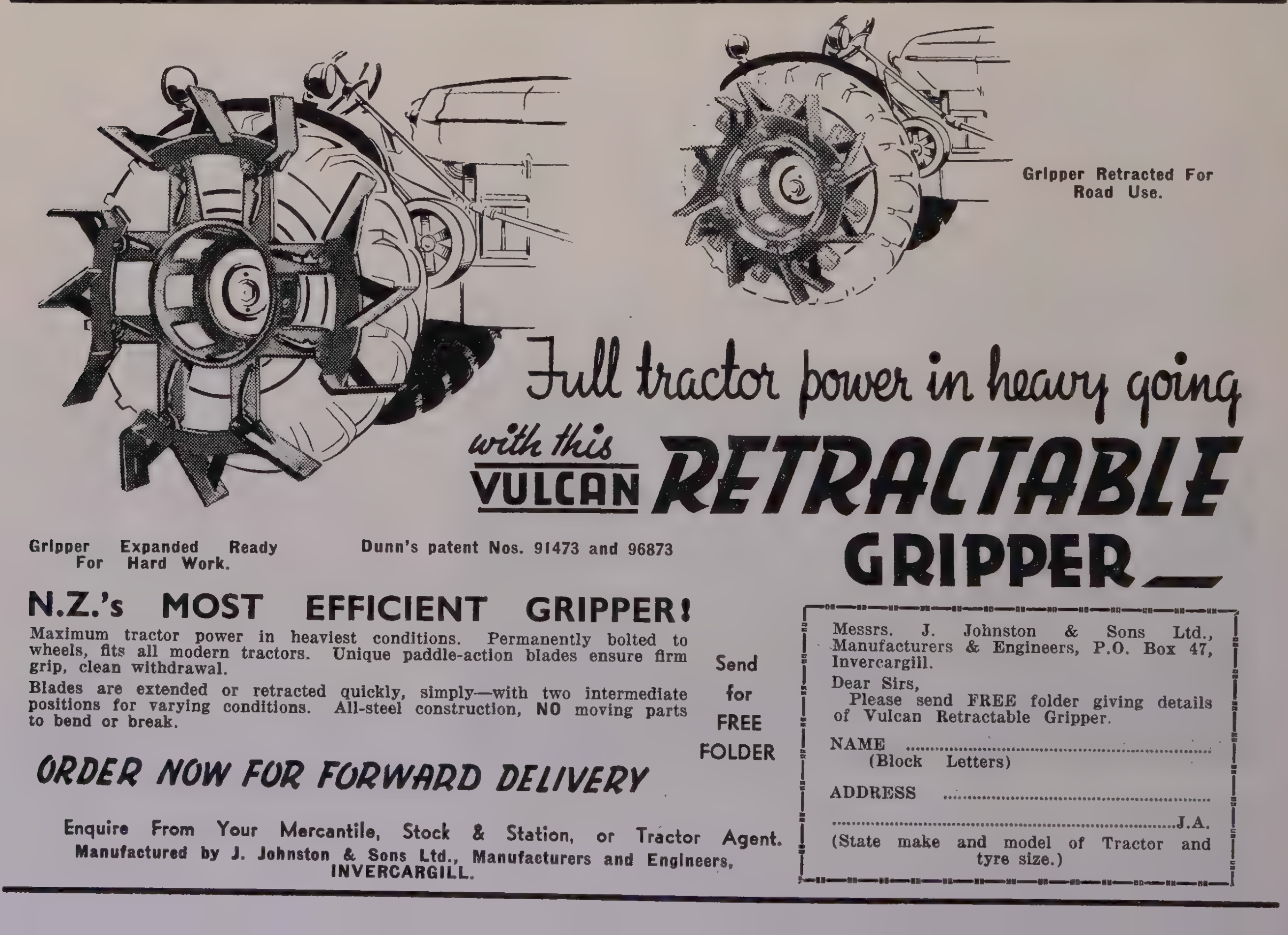
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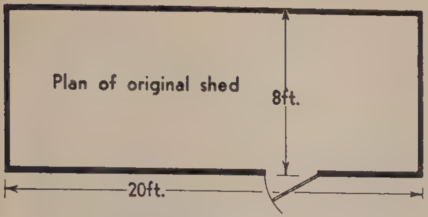
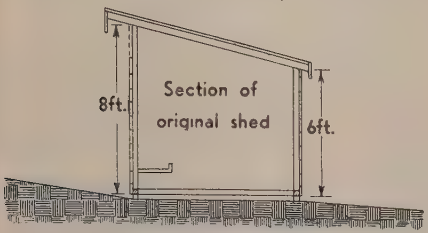
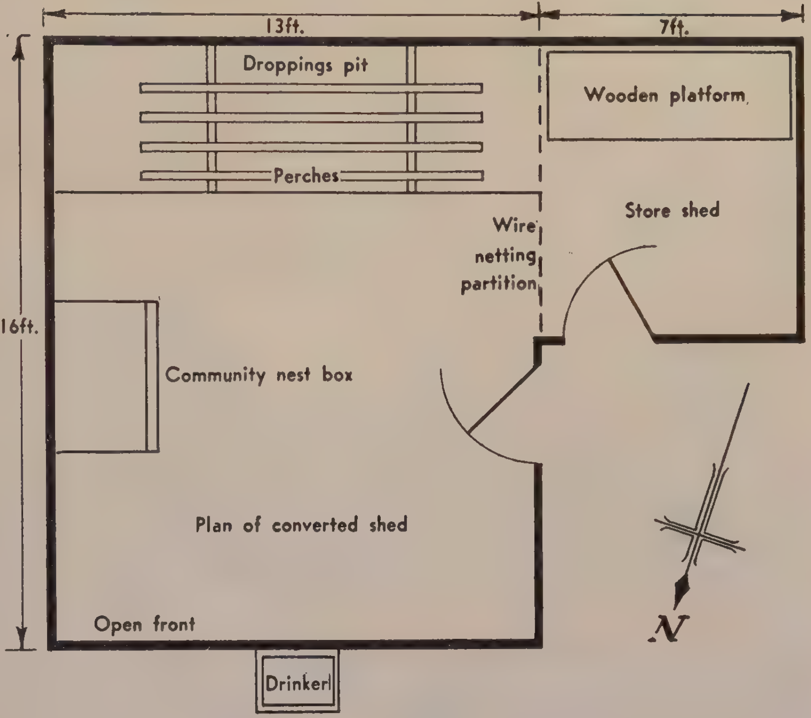
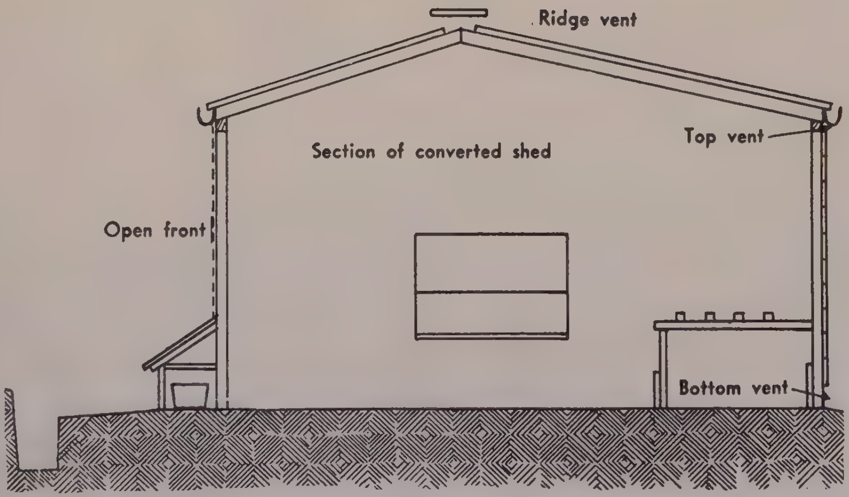








About the only redeeming feature of the old shed was the ventilation opening along the top of the rear wall.

The ridge and eave ventilation has ensured a fresh atmosphere at all times in the house. The gaps around the bases of the walls (except the front wall) were turned to advantage by baffling them to keep floor litter in and by adding wire netting to keep vermin out. The floor ventilation thus produced undoubtedly played a large part in keeping the shed floor dry.

Once the walls were completed, the earth floor inside the foundations was levelled. This was allowed for when the floor ventilation was fixed up.

Four perches of 4in. x 2in. were placed on two simple supports over a form of droppings pit made by nailing a 9in. board on edge along the front of the perch supports at ground level. This board kept most of the litter from being scratched backward under the perches.

The drinker, shown in the diagram at right was made from an old household kitchen sink, supported on brackets fastened to the low front wall and covered with a sloping lid. Birds put their heads through a wire grill to drink. Very little water was spilt inside the house by this arrangement. Except in the hottest weather, one sink of clean water lasted the birds all day. The drinker was filled by removing the sloping lid. The sink itself was not fixed to the brackets and was easily moved for cleaning.

A community nest box was fitted, as this type is the easiest to make and is satisfactory. A set of old wooden wash tubs was dismantled, rebuilt, and with a small amount of additional timber made a satisfactory community nest box 4ft. long by 20in. deep. This was mounted on a side wall and a sloping roof added with wire netting blocking the ends.

During winter it was necessary to add a curtain to the open front. Two sacks split open along the seams and fitted with home-made wire hooks were all that were required. The curtain was hung from a wire stretched along the front and the bottom edge was hooked to the top of the low front wall. This covered the bottom 2ft. of the wire front and was all that was needed to keep out driving rain. It was needed during westerly weather only.

During one very wet spell surface storm water made the floor near the front of the shed very wet and soggy. An open drain 3ft. from the front and extending along the front and down one side has since been dug. This dried the floor and prevented a recurrence of the trouble.

From the outset it was planned to maintain the 50-bird flock with the minimum of care and attention commensurate with reasonable egg production.

Ad lib. dry mash and free-choice meat meal plus wheat scratch feeding were decided on as the feeding system. One trough 4ft. long with a short section at one end for meat meal was built to provide for 50 perching pullets. Later a second trough 3ft. long was made. This gave a total length of 7ft. of double-sided dry-mash troughs, which was ample feeding space for more than 50 adult birds.

The troughs were made from used lengths of 8in. weather-boarding and odd lengths of 2in. x 1in. timber. The troughs looked rough, but gave every satisfaction in use. They held sufficient food for 3 days, without their being overfilled. Both troughs had a small section for meat meal. Two small hoppers for shell grit and hard grit completed the equipment of the shed.

The small store section next to the laying shed was cleared and a low wood platform was fitted along the back wall. All food was emptied from the sacks it was supplied in, and packed into tins. Vermin were thereby discouraged and waste prevented.

Acreage in Vineyards in New Zealand

The area established in vineyards in New Zealand was given as 110 acres on page 262 in the article "Wines and Wine Making" in last month's "Journal". The figure should have read 1100 acres.

Recent Research Work

EARTHWORMS

THAT the existence of earthworms in the soil not merely improves its physical condition but also causes a greater plant yield has been shown in a number of experiments carried out in other countries. A few workers have obtained no increases in growth, which may mean that not all soils or all plant species show a response to earthworm activity. Experiments recently conducted at the Rukuhia Soil Research Station, Hamilton, show that some common pasture species respond to earthworms with greater weight of growth both in the green and the dried states; the results varied, however, with different soils.

TURF TRIALS

IN the first experiment a few turves about 15in. square were collected from two widely separated districts of the North Island and were sent to the Soil Research Station for observation. They were trimmed to equal depth and placed in wooden boxes containing subsoil clay. It was necessary to raise these boxes on stands to prevent ingress of earthworms from the ground. The turves were taken from country in which worms had been observed to be spreading. Two of them came from the hilly district of Horoeka, 30 miles west of Dannevirke. Although only a few yards apart, one showed signs of earthworm activity but the other did not, both in other respects being identical.

A further set was collected from Ruatiti near Raetihi. In this set it was possible to obtain a graded series in which two turves of the group had no earthworms (except one or two of the manure worm *Lumbricus rubellus*), another two from near the margin of the earthworm "invasion" contained about a dozen each of the manure worm and the casting worm *Allolobophora caliginosa*, and a final two from soil populated by earthworms for a number of years contained upward of a hundred, mainly *A. caliginosa*. All the Raetihi turves were taken from level ground in one paddock and had exactly the same soil type and manurial history. Scarcely 100yds. separated the first and last members of the series.

After the turves were placed in the boxes there was no further treatment other than applications of water as required. The grass was cut at intervals of 6 to 9 weeks. weighed, dried, and finally returned to the respective boxes. At the end of 20 months the following total oven-dried weights of grass were obtained. (The figures for the Raetihi turves are the means of two.)

YIELD OF GRASS FROM TURVES

Source	Soil type	Total oven-dry weight of grass (grammes) Period 20 months No earthworms	With earthworms	Gain in wormed boxes per cent.
Horoeka	Sandy loam	50	110	120
Raetihi				
Low worm density	Silt loam	90	150	70
High worm density	Silt loam	90	150	70

SOIL TYPES

Concurrently with the experiment described a similar one was carried out with a small range of soils. These were heat treated at 60 degrees C. to destroy any living earthworm cocoons and placed in boxes similar to those used for the turf experiment. One pair of boxes was set up for each soil type, there being insufficient in most cases to permit of replication. The average depth of soil was 6in. with about 9in. of clay beneath. All were sown with a pasture mixture containing perennial ryegrass, cocksfoot, browntop, and white clover, and finally 100 earthworms of the species *A. caliginosa* were introduced into one only of each pair of boxes. Watering and harvesting were carried out exactly as with the turves and this trial also lasted 20 months. The results obtained are given in the table in the next column.

The superiority of the soils containing earthworms was more or less consistently maintained at each harvest. The greatest gains were evident in spring, when earthworms are most active, and they were lowest in summer, during which earthworm activity is greatly reduced. The Raetihi soil was of the same type as that of the turves referred to previously and a similar result was obtained in the two experiments. Pasture responses to earthworms were by no means constant in various soil types in these trials. The soils were tested under the same climatic conditions during the experiment, and greater variations in pasture response might be found if each soil were to be tested in its original environment.

YIELD OF GRASS FROM VARIOUS SOILS

Source	Soil type	Total oven-dry weight (grammes) No earthworms	With earthworms	Total gain in wormed boxes per cent.
1. Raetihi ..	Silt loam	40	70	80
2. Kakatahi (Wanganui) ..	Sandy silt loam	130	190	50
3. Hamilton ..	Clay loam	220	280	30
4. Ohakune ..	Silt loam	80	130	60
5. Rangiahua (Nth. Auckland) ..	Silty clay	80	170	110
6. Te Pohue (Hawkes Bay) ..	Coarse sandy silt	100	160	60
7. Hamilton ..	Sandy loam	260	340	30

IMPROVEMENT OF PASTURE SWARD

When earthworms, particularly of the *A. caliginosa* type, invade new country (and there are some areas of New Zealand still unpopulated by them) a change in the pasture composition is observable. In their absence large areas of danthonia-browntop country, especially in the King Country, have been noticed to have a tendency toward a root-bound sward. The advent of earthworms has resulted after several years in a change to a pasture containing a higher proportion of ryegrass and clovers, provided, of course, that these species were present initially. Various theories have been advanced to explain the effect of earthworm activity on plant growth, and among them increased aeration and drainage as well as improved soil structure have some experimental support, especially the last named. Work carried out at the Rukuhia Soil Research Station indicates that even more important than these factors may be the secretion into the surrounding soil by earthworms of a substance at present unidentified. Biological tests have established the presence of such a substance, which is secreted principally into the digestive tract and so to the soil in minute traces, sufficient, however, to influence plant growth to an appreciable extent.

—*R. L. NIELSON*

* * * *

OVERSOWING HILL COUNTRY

TO find out which clovers and grasses are most suited for the improvement of hill-country pastures and the time of the year to obtain the best strike and establishment, four areas representative of Wairarapa hill country were oversown in 1948. These trials included the mudstone country at Hinakura, limestone at Longbush, sandstone at Stronvar, and greywacke near Matahiwi, all under varying climatic conditions.

Six different times of the year were selected for the sowings to determine the most suitable month for oversowing with grass and clover seed. Three plots were sown in autumn (March, April, and May) and three in spring (August, September, and October), the following seeds mixture being used: 10lb. of perennial ryegrass, 10lb. of short-rotation ryegrass, 3lb. of crested dogstail, 2lb. of subterranean clover, 1lb. of white clover, 1lb. of strawberry clover, 2lb. of cowgrass, 2lb. of Montgomery red clover, ½lb. of *Lotus major* and ½lb. of *Lotus hispidus* per acre. At the times of sowing each plot received 2cwt. of phosphate. Establishment and coverage of clovers in the autumn-sown series were generally better and more promising than from the spring sowings. March sowings were the most successful in all trials, followed by April and May sowings. (In general the later sowings gave poorer results.) Of the sown clovers subterranean, white, and red clovers were the most successful, but *Lotus major* and strawberry clovers proved failures. The trials also showed that the introduction of perennial ryegrass, short-rotation ryegrass, and crested dogstail by oversowings was not a success on hill-country pastures where the seed tended to lodge in the existing sward. On any exposed faces where surface slipping had taken place grass species gave better results.

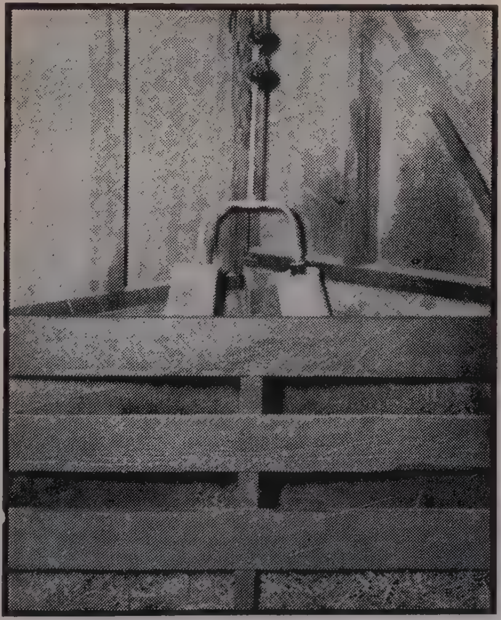
—*W. B. H. SMITH*

Warm Farrowing Houses

FARROWING houses that keep sows and newly born litters warm mean fewer losses and more pigs reared. In this article I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, discusses this important point in pig management, particularly the advantages of brooders.

DURING the next 2 months large numbers of sows throughout New Zealand will be farrowing. How many of the piglets in these litters are going to be lost? Results of the surveys of losses in pigs carried out 2 and 3 years ago would indicate that about 22 per cent. of the pigs that are farrowed will be lost before they are weaned, and most of these losses will occur during the first week. Research work during the last few years has shown that no single factor is more important in combating early losses than warmth. Farmers should do everything they can to see that the houses in which their sows will farrow during winter and early spring are as warm as possible.

The first, and elementary, step is to make sure that the roof is sound and watertight and is sarked underneath. It is best to have a layer of insulating material between the corrugated iron, asbestos board, or other exterior roofing material and the sarking. This can be done effectively by packing the space between them with sawdust. If there are any ventilation openings under the eaves, these should be closed, and if the front of the house is open, it should be closed by shutters, except for the doorway through which the pigs go in and out. Walls should be soundly constructed and sleeping floors made of warm material such as coke breeze cement.



Infra-red lamp fixture in brooder; it is fitted with an infra-red dull emitter and a 40-watt light globe, controlled by separate switches.

Artificial Heat

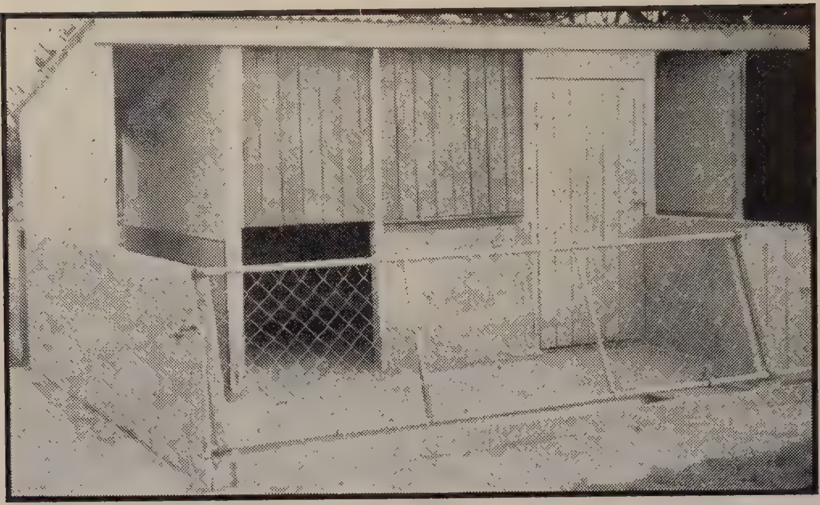
The ideal temperatures for newly born litters of pigs are between 75 and 80 degrees F. To obtain these where no artificial heat is used is difficult, as then the only source of warmth is the heat given off by the sow and litter. However, careful attention to the details given in the previous paragraph can achieve remarkably successful results. Use of artificial heat has been common in Great Britain for many years, but has not been adopted to any great extent in New Zealand, although those farmers who have tried it have got excellent results.

The artificial heat provides warmth to the newly born piglets and the method is usually as follows: A rail is fixed across one corner of the farrowing house at the usual height of a farrow rail (about 9in. above the floor). This leaves a triangular space, which should be about 3ft. x 3ft. x 4ft. 6in., in the corner. A second rail is fixed across the same corner above the first at a height of 3 to 4ft. from the floor and vertical battens are nailed on to the two rails, thus forming a barrier across the corner, behind which a lamp is placed. The barrier prevents the sow from knocking against the lamp, but the piglets can get into the corner under the bottom rail.

Infra-red Lamps

If it is possible to get electricity to the piggery at reasonable cost, the best type of heat appliance is an infra-red lamp. There are two types of this lamp, a dull emitter and a bright emitter; the former gives heat without light and the latter gives both. It has been found that light attracts newly born piglets. Where a dull emitter is used a fitting that carries a 40-watt light bulb as well as the infra-red lamp is used, and a switch is provided so that both can be used at once or the heat lamp only. Where the bright heat lamp is used this arrangement is not necessary.

The use of two lamps was adopted because it was thought



Farrowing house with shutters closed.

that though light was necessary to attract newly born piglets into the brooder (as the railed-off corner is usually called), continuous light might have a disturbing influence on them. With the two lamps heat only could be used after a few days when piglets were used to going into the brooder.

However, the light has been found to have no apparent ill effects on the piglets. On the other hand the dark heat lamp has a very much longer life than the bright heat lamp, and the cost of renewal of the latter is very much more than that of a 40-watt light bulb. The system to be used will depend on choice.

Controlling Temperature

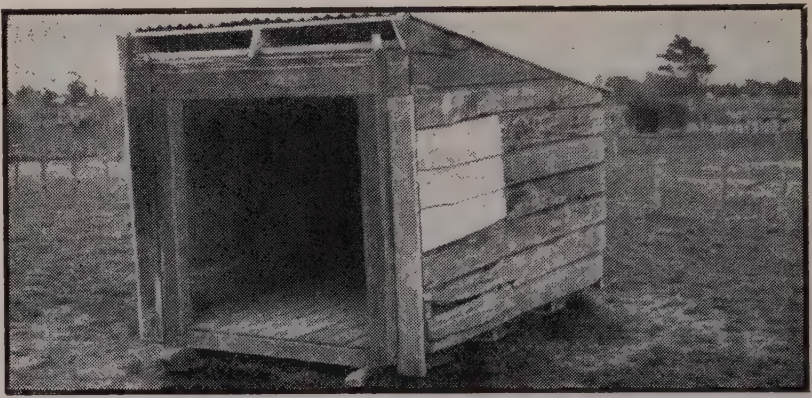
The lamp or lamps are hung behind the protective screen so that their height above the floor can be varied, and in this way the amount of heat the piglets get can be controlled. The aim should be to keep the temperature at floor level at between 75 and 80 degrees F.

Substitute for Electric Heating

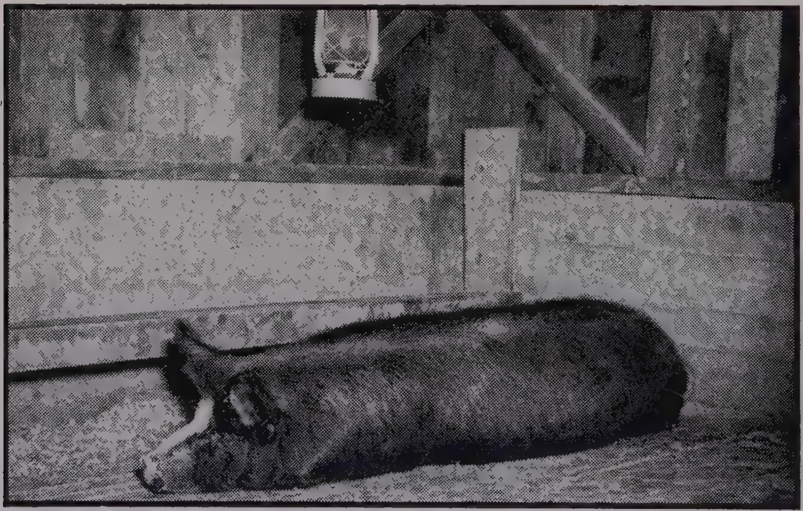
Where it is not possible to get electricity to the piggery an ordinary storm lantern hung in the brooder about 18in. above the floor will be found to make a great difference. The temperature cannot be kept at exactly that required, but it will be very much warmer in the corner than elsewhere attracted there by the light.

The most important time for the use of the heat lamps is the first week after farrowing. At birth there is a big drop in the body temperatures of piglets and it takes some days before their normal temperature-regulating mechanisms function fully. During this period piglets are extremely susceptible to chills, often with disastrous results. After 2 to 3 weeks, according to the weather, the use of the lamps is no longer necessary.

Artificial heat for newly born litters has proved its worth overseas and, where it has been used, in New Zealand. Its use is worth serious consideration by all New Zealand breeders. The cost of installation is not very high and is very soon recovered through extra pigs reared per litter.



This type of housing is bad.



An ordinary storm lantern will raise the temperature some degrees.

Small Air Space

Farrowing houses must be constructed so that they are really warm, and for this reason the air space in them should be kept as small as is possible for convenient working. When the weather is hot it may be necessary to take steps to keep houses cool, but this is necessary for only a few hours in the middle of the day and can be done easily by opening the shutters in the front of the house and keeping the concrete feeding yard in front of the sleeping quarters wet. The evaporation of the water will lower the temperature as much as 10 degrees F. which is sufficient to make the pigs comfortable. This is necessary only on comparatively few days in the year and for only a few hours during the middle of the day. It is never too hot at night and shutters should be closed in the evening.

Warm farrowing houses mean fewer losses and therefore more pigs reared and a bigger profit.

Savoury Hot-pots and Casseroles

By NELL MACPHERSON, Field Officer in Rural Sociology, Department of Agriculture, Auckland

AS winter approaches hot savoury dishes assume more importance in the menu. Many people say that they do not like stews because they are dull and flavourless. They need not be so. They can be just as appetising and interesting as any other dish whether the basis of the stew is meat, fish, egg, or vegetable. Hot-pots and casseroles are cooked by the stewing method. The dishing of them is very important, because if they are poorly served, they look messy and unattractive. They need garnishing to improve their appearance.

French veal, the recipe for which will be found in "Cheaper Meat Dishes" in the February issue of the "Journal".

IN making hot-pots as much fat as possible should be trimmed off the meat before cooking and the gravy should be skimmed with a metal spoon before it is thickened.

Herbs and spices make a great difference to the finished products and by the use of various herbs and spices the simplest basic recipes can take on new flavours. Often by experimenting the perfect flavouring can be found for a dish which adds yet another recipe to the family favourites.

These recipes may be used for either lunch or tea dishes and are grouped according to the main basic ingredient.

There are many simple suitable garnishes, of which some can be prepared well ahead and stored in airtight tins, some can be picked from the garden and used immediately, and some can be cooked with the casserole or prepared while it is cooking.

Pastry shapes can be cut from scraps of pastry and baked and stored; dry breadcrumbs can be prepared ahead and stored in glass jars; lemons (in the more northerly parts of New Zealand), parsley, chives, and mint can be picked straight from the garden; croutons, toast triangles, vegetable sticks, and radish roses may be prepared while the dish is cooking.

Fish and Egg Casserole

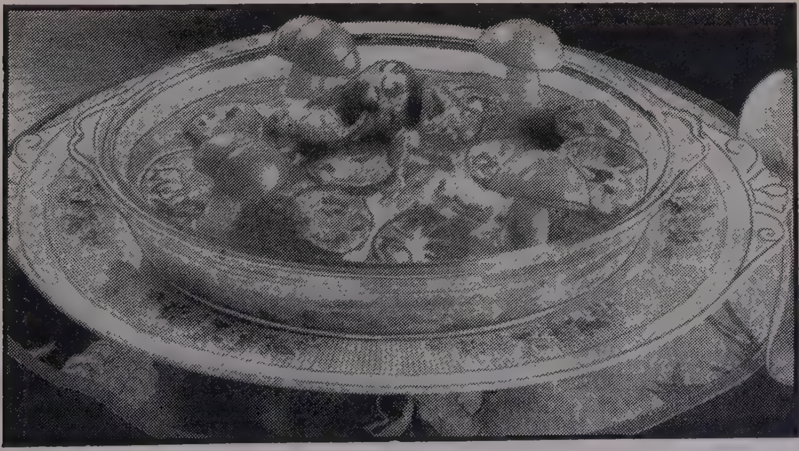
1lb. of cooked smoked fish
2 tablespoons of lemon juice
2 sliced hard-boiled eggs
5 tablespoons of flour
1½ cups of milk
½ teaspoon of salt
3 tablespoons of butter or fat
Pepper
1 cup of grated cheese
½ cup of soft breadcrumbs (mixed with 1 tablespoon of melted butter)

(Heat the oven to 375 degrees F.)

Flake the fish and add the lemon juice. Now arrange the flaked fish and sliced eggs in layers in a 3-pint casserole.

Melt the butter or fat in a saucepan; add the flour and blend it in. Add the milk, seasonings, and cheese. Cook the sauce until it thickens. Pour the sauce over the ingredients in the casserole and sprinkle the top with the breadcrumbs. Bake at 375 degrees F. (moderate oven) for 30 minutes or until the crumbs are brown. Garnish with a sprig of parsley. (4 servings.)

BELOW: Fish and tomato casserole garnished with tomato mushrooms.



Fish and Tomato Casserole

4 fish steaks (groper (hapuku) or moki)
4 large tomatoes, if in season
4 small tomatoes, if in season
1 large parsnip
2 tablespoons of vinegar
½ cup of milk
Cayenne
Pepper
1 teaspoon of salt

Arrange the steaks in a greased casserole and add the milk and seasonings and cook for 15 minutes at 350 degrees F. (moderate oven). Peel the parsnip and cut it into four even sticks. Cook these in boiling water. Slice the large tomatoes on to the fish and pour the vinegar over them. Return the casserole to the oven and brown the tomatoes (10 to 15 minutes). Cut a small section out of each small tomato and insert a parsnip stick into each. Arrange these at each corner of the dish and serve it. (4 servings.)

Snapper Wiggle

1 cup of cooked flaked snapper
White sauce
1 cup of cooked peas or green beans
2 tablespoons of grated cheese
1 teaspoon of chopped mint

White Sauce

1½ cups of milk
3 tablespoons of butter
3 tablespoons of flour
½ teaspoon of salt

Heat the butter and 1 cup of milk. Mix the flour and salt with the remaining ½ cup of milk. Add the hot mixture and stir well. Return it to heat and cook until it thickens. Add the fish and peas and fold them in. Turn the mixture into a greased casserole and sprinkle with the cheese and mint. Brown in the oven until the cheese melts. (2 to 3 servings.)

Baked Fish (Swiss Style)

2lb. of fish
Salt and pepper
½ cup of butter
¼lb. of mushrooms
1 cup of cream or top milk
1 teaspoon of beef extract

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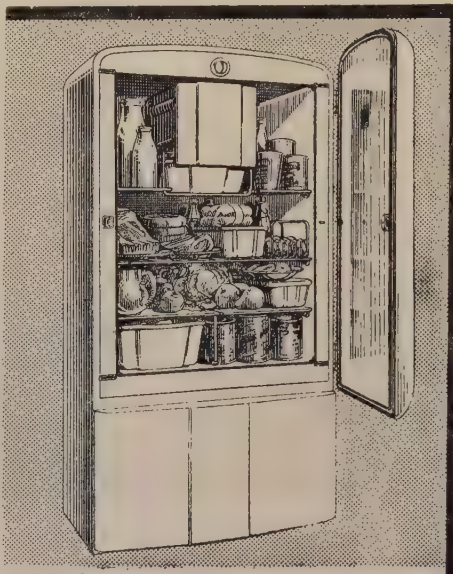

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Wipe the fish and place it in a greased casserole. Sprinkle with salt and pepper and place the butter on top. Bake 15 minutes at 350 degrees F., basting it twice. Cover the fish with the mushrooms and cream. Bake a further 15 minutes. Spread the beef extract on top and bake a further 10 minutes. Garnish with lemon slices. (6 servings.)

Eggs and Spaghetti

4oz. of spaghetti
4 eggs
1 cup of tomato puree
1 teaspoon of Worcestershire sauce

Cook the spaghetti in boiling salted water. Arrange the cooked spaghetti in a greased casserole and break the eggs carefully on to it. Mix the Worcestershire sauce with the tomato puree and pour it over the eggs. Bake 20 minutes in a slow oven (325 degrees F.). Serve with triangles of toast or pastry shapes.

Scalloped Eggs

6 hard-boiled eggs
1½ cups of white sauce
1 teaspoon of salt
2 tablespoons of buttered crumbs

White Sauce

1½ cups of milk
3 tablespoons of butter
3 tablespoons of flour
½ teaspoon of salt

Heat 1 cup of the milk with the butter. Mix the flour and salt to a paste with the remaining milk. Combine the mixtures and cook until it thickens.

Chop the hard-boiled eggs and sprinkle with the salt. Arrange them in alternate layers with the white sauce in a greased pie-dish. Cover with the buttered crumbs and bake in a moderate oven (375 degrees F.) until the crumbs brown and the sauce bubbles. (4 servings.)

Egg Pie

6 eggs
3 tomatoes, if in season
1 cup of mashed potatoes
½ cup of breadcrumbs
6 shallots or pickling onions
2 tablespoons of butter
Salt and pepper to taste

Melt the butter and gently brown the peeled sliced shallots in it. Grease a pie-dish and spread a thin layer of breadcrumbs on it. Spread the browned shallots on this and pour any remaining butter over it. Cover with a layer of mashed potatoes and sprinkle salt and pepper on the potato. Slice the tomatoes over the mashed potatoes and then gently break the eggs on to them. Very carefully spread the remainder of the potato over the top and sprinkle with the remainder of the breadcrumbs. Dot a little butter over the surface. Bake 20 minutes in a hot oven (400 degrees F.). (6 to 8 servings.)

Lancashire Hot-pot

1lb. of neck of mutton or neck chops
2 sheep kidneys
½lb. of onion
½ pint of stock
2 tablespoons of flour
1 tablespoon of dripping
1 teaspoon of salt
Pepper
A few leaves of sage
A few leaves of mint

Cut the mutton into neat pieces and peel and slice the onions; slice the kidneys. Melt the dripping and brown the meat and onions. Remove from the pan to a casserole. Brown the flour in the fat and stir in the stock, salt and pepper, and sage and mint. Slice the peeled potatoes over the meat and pour the gravy over all. Cover and bake at 350 degrees F. (moderate oven) for 2 hours. Remove the lid and brown the potatoes. (4 to 6 servings.)

Preparing egg and spaghetti.

Haricot Mutton

1½lb. of neck of mutton
1 large onion
1oz. of flour
1 teaspoon of mixed herbs
2 large tomatoes, if in season
Salt and pepper to taste
¾ pint of water
2 carrots
1 white turnip
3oz. of haricot beans
20 peppercorns

Tie the herbs and peppercorns in a muslin bag. Cut the meat into neat pieces. Peel and slice the onions, 1 carrot, and the turnip. Add the seasonings to the flour and coat the mutton pieces in it. Put the mutton into a greased casserole; add the onions, carrot, turnip, any remaining flour, the herbs and peppercorns in the bag, and the water. Spread the beans over the top. Cover closely and simmer for 2 hours at 350 degrees F. Cut the remaining carrot in slices lengthwise and slice the tomatoes. Arrange these over the stew and cook them a further ½ hour or until the carrot slices are tender. (6 servings.)

Casserole Steak

1lb. of lean stewing beef
½lb. of onions
1oz. of flour
1½oz. of dripping
¼lb. of mushrooms
¾ pint of stock
2 large carrots
1 small swede
3 tomatoes, or tomato sauce to taste
Salt and pepper to taste
Garnishings of small carrots, mushroom buttons, chopped parsley

Trim the fat from the meat and cut it in neat pieces; slice the onions and prepare the mushrooms. Mix the flour and seasonings and coat the meat with them. Melt the dripping and brown the meat. Put it in a casserole. Fry the onions, add any flour remaining and blend well. Add stock and cook until it thickens.

Pour this sauce over the meat in the casserole. Add the sliced carrots, swede, and mushrooms. Cover and cook in a moderate oven (350 degrees F.) for 1½ hours. Decorate the top with small cooked carrots and mushroom buttons and sprinkle generously with parsley. (4 to 6 servings.)

Goulash

1½lb. of veal brisket or flank
3 medium-sized onions
1oz. of fat
1 or 2 cloves of garlic
2 medium-sized potatoes
Salt and pepper to taste
½ teaspoon of caraway seeds
5oz. of water or stock
1 small wine glass of red wine

Melt the fat and cut the meat into neat pieces. Brown it gently in the fat. Add the peeled sliced onions and brown them. Add the stock, garlic, salt, pepper, caraway seeds, and sliced potatoes. Cover and cook for 1½ hours. Thicken the gravy if necessary with a little flour and add the wine. Stir thoroughly and simmer 5 minutes. Serve in a bowl garnished with toast fingers. (6 servings.)

Fricassee of Rabbit

1 rabbit, jointed
1 small carrot
1 onion
4 cloves
12 peppercorns,
  1 sprig of thyme,
  1 sprig of parsley,
  tied in a muslin bag
1 or 2 sticks of celery
Lemon juice
Salt and pepper to taste
1½oz. of flour
1oz. of fat
¾ pint of water
¼ pint of milk

Soak the rabbit for 2 hours in salted water (1 teaspoon of salt to 1 pint of water). Rinse it and drain it. Put the peeled onion, stuck with the cloves, the carrot, celery, and herbs in the bag in a saucepan with the water and bring to the boil. Add the rabbit pieces and salt and pepper. Simmer gently until tender (1½ hours). Pile

Garnishing cheese lunch dish with chopped parsley.

the rabbit on a hot dish. Strain the liquor. Melt the fat in the saucepan; add the flour and blend it without browning for 3 minutes. Mix in the liquor a little at a time, stirring until it boils. Add the milk, rabbit, and lemon juice. Heat gently for 5 minutes. Serve rabbit on the hot dish and cover it with the sauce. Arrange a line of thin lemon slices down the centre of the dish. (4 to 6 servings.)

Oxtail Stew

1 large oxtail, jointed
2 onions
6 cloves, 1 teaspoon (or 2 sticks) of cinnamon, 6 leaves of sage, 1 apple, chopped, tied in a bag
2 carrots
1 swede
1 pint of water
1oz. of flour
1 teaspoon of salt
⅛ teaspoon of pepper
1 tablespoon of fat

Melt the fat in a saucepan and brown the oxtail in it. Pour off the fat; add the peeled sliced onions, carrots, and swede, the herbs in the bag, salt, pepper, and water. Cover and bring to the boil, simmer for 2 hours, skimming the fat from time to time. Allow to cool slightly and remove any remaining fat and the herbs. Mix the flour to a paste with a little cold water. Thicken the stew with this and cook very gently for another hour.

Jugged Hare, Rabbit, or Fowl

2lb. of hare, rabbit, or fowl pieces
2 carrots
2 onions
Sprig of parsley
Sprig of thyme
1 pint of stock
1 teaspoon of ground allspice
A wine glass of port
2 tablespoons of flour
Salt and pepper to taste

Prepare the vegetables and chop finely. Put the meat, vegetables, spice, salt, pepper, and finely chopped herbs into the stock. Cook gently for 2½ hours. Remove from the heat. Remove the meat from the liquor and thicken it with the flour mixed to a paste. Remove the bones from the meat and return it to the thickened liquor. Reheat, and add the port 10 minutes before serving. Serve with pastry shapes.

Liver Casserole

½lb. of liver (cut in neat pieces)
2 slices (½in.) of bread
1 onion
1 carrot
1 tablespoon of flour
2 rashers of lean bacon
1 cup of water or stock

Grease a casserole. Line it with the bread. Flour the liver and place it on the bread. Add the sliced onion and carrot and lay the bacon over it. Pour the water into the casserole. Cover and cook at 350 degrees for 1¾ hours. Remove the lid and cook a further ¼ hour to crisp the bacon. Serve with toast triangles.

Cheese Crumb

1lb. of mild cheese
2½ cups of stale breadcrumbs
2 tablespoons of butter
3 slightly beaten eggs
2 teaspoons of salt
¼ teaspoon of paprika
1½ cups of milk

Crumble or grate the cheese. Mix the salt and paprika. Grease a casserole. Sprinkle one-third of the breadcrumbs on the bottom; sprinkle one-third of the cheese over this and then one-third of the salt mixture. Repeat this twice. Mix the milk and eggs and pour over the ingredients in the dish. Bake 25 minutes in a moderate oven (350 degrees F.). Garnish with tomato wedges. (6 servings.)

Cheese Lunch Dish

2 eggs
1 cup of cream or top milk
1 teaspoon of salt
½ teaspoon of mustard
Cayenne
½lb. of grated cheese
Stale bread, cut into fingers
Butter

Butter the bread and line a greased casserole with it. Combine the other ingredients and pour into the casserole. Bake 30 minutes in a moderate oven (350 degrees F.). Garnish with chopped parsley. (6 servings.)

Variation: Add 2 tablespoons of chopped onion and 1 teaspoon of Worcestershire sauce to the cheese mixture.

Macaroni Cheese

8oz. of macaroni
2 cups of grated cheese
2 cups of white sauce
½ cup of buttered breadcrumbs

The macaroni should be boiled in salted water and drained.

White Sauce

2 cups of milk
4 tablespoons of flour
4 tablespoons of fat
1 teaspoon of salt

Heat 1½ cups of the milk and the butter to boiling. Mix the flour and salt to a paste with the remaining milk. Add the hot mixture to the cold one; stir well and return to the heat. Cook until it thickens.

Grease a casserole and put in it a layer of macaroni, then a layer of cheese, and then a layer of white sauce. Continue until all the ingredients are used. Sprinkle with buttered breadcrumbs. Cook in a hot oven (375 degrees F.) until the crumbs brown. Garnish with chopped chives. (8 servings.)

Baked Beans

2 cups of beans (not green beans)
¼lb. of bacon, cut thick
1 teaspoon of mustard
1 tablespoon of treacle
½ teaspoon of salt
Good shake of pepper

Wash the beans and soak them overnight. Drain them and cover with cold water. Bring slowly to the boil and cook until skins just burst. Strain off the water and mix half of it with the mustard, treacle, and salt. Lay half the beans in a casserole and place the bacon rashers on them. Add the remainder of the beans. Pour the mustard mixture over this, adding more of the hot water, if necessary, just to cover the beans. Put a lid on the casserole and bake 6 hours in a slow oven (300 degrees F.). Draw the bacon to the surface and cook for ½ hour with the lid off. Garnish with toast triangles. (6 to 8 servings.)

Pea Casserole

2 cups of dried peas
1 cup of tomato pulp or puree
1 cup of stock
1 finely chopped onion
2 finely chopped cloves of garlic
2 teaspoons of salt
¼ cup of butter

Soak the peas overnight. Drain, add water, and bring to the boil. Cook until soft. Drain and place the peas in a greased casserole. Dot the butter over them. Mix the other ingredients and pour over the peas. Cook in a slow oven (275 degrees F.) until the peas have practically absorbed the sauce. Garnish with pastry shapes. (6 servings.)

Macaroni and Green Beans

4oz. of macaroni
3 tablespoons of fat or butter
½ teaspoon of Worcestershire sauce
¼ teaspoon of mustard
¾ teaspoon of salt
⅛ teaspoon of white pepper
3 tablespoons of flour
2 cups of milk
1 tablespoon of minced onion
1¾ cups of grated cheese
2 cups of cooked green beans

Cook and drain the macaroni and put it and the beans in the casserole. Melt the fat, add the flour, mustard, salt, pepper, sauce, and blend.

Gradually add the milk, stirring to prevent lumps. When it begins to thicken stir in 1½ cups of the cheese. Pour it over the macaroni and beans. Stir with a fork and sprinkle the remaining cheese over the top. Bake in a moderate oven (375 degrees F.) for 30 minutes.

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Autumn Tints in Drives and Gardens

AS autumn approaches with cooler days and frosty nights landscape colours change, and the season's beauty is typified by lines of golden poplars, golden willows following the bends and curves of rivers, and groups of golden oak trees. Many countryside autumn scenes are on a scale with which the average garden because of its restricted space cannot compete, but the gardener is inspired by them to contribute his own display of autumn tints. In this article, M. J. Lockie, Horticultural Instructor, Department of Agriculture, Auckland, discusses and outlines the uses of various trees and shrubs noted for their autumn colouring.

TREES and shrubs to prolong summer colours into autumn are practical plants to include in garden planting.

Where there is ample room in a large garden tree planting for autumn effect may include such big species as the oak, the ash, the tulip tree, and even the poplar. They may be planted along the outer boundary of the garden or lined along each side of the drive. These large trees may be used singly as specimens or in groups of three or four. Wherever they grow their cool shade and solid greenness will be enjoyed during hot summer days, and in autumn they will give pleasure to all who see them.

Elm trees could be included in this group of large-growing trees, but their uses are limited by the tendency they have to shed large limbs without warning. They are not safe to line paths or driveways, but weeping elms are popular as lawn trees. The cork-barked elm (*Ulmus racemosa*), a finer-trunked, upright, suckering variety, can be allowed to take charge of a rise behind the house or a piece of sloping land a little distance away, yet close enough to be seen from the windows. In spring, too, the dainty, pale green seed heads are useful for interior decoration.

A brilliant display of autumn leaves set against a line of dark evergreens does much to lighten a shelter belt, whether it surrounds the house or when it can be seen from a window.

In all but the smallest garden there will be room for at least one small tree, and a tree with two or more displays a year will be of greater value.

Suitable trees would be the flowering cherry, with a profusion of white flowers in spring and orange and red leaves in autumn, or strawberry tree (*Cornus capitata*), with cream flowers in early summer and clusters of red and purple strawberry fruit in autumn. The little crab apple (*Pyrus malus gorgeous*) is bright with bunches of yellow and red fruit in autumn.

Two fruit trees which need not be relegated to the kitchen garden are the apricot and the persimmon. Although apricots do not fruit in all districts, they make good ornamental trees. The foliage is dense and the young leaves on the growing tips are light orange, giving the effect of sunlight on the tree. Before shedding its leaves the tree gives a good display of autumn colour.

The persimmon with its naturally attractive shape and large, rounded, smooth green leaves is effective at all seasons; particularly so after its gold leaves have fallen and its deep orange fruit are hanging from the smooth brown stems.

The walnut, suitable only in bigger gardens, is another tree which may be overlooked, but its shade in summer is dense and cool, and in climates with early frosts its autumn display is magnificent. However, the dense shade and heavy drips of rain from its large leaves seem to inhibit the establishment of plants beneath it and even grass will tend to thin when the tree is in leaf, so that it is unsuitable on lawns.

Planting for Effect

Repetition of the same shrub or shrubs is one of the simplest ways of making the garden plan seem natural, although too many shrubs all turning the same colours in autumn may spoil the effect. With the gradual dying down of herbaceous plants and annuals more attention can be paid to leaf patterns and leaf colouring of individual shrubs. Groups with coloured foliage should be planted near the front of the border, and evergreens and green foliage plants will make a background for them.

For a really good display of coloured leaves a long, cool, dry autumn season is the best and the trees should be growing in a fairly dry and sheltered position. Exposure to buffeting winds usually means the leaves are whipped off before they colour properly.

Trees and Shrubs with Leaves Turning to Gold

Willows and poplars both establish readily from cuttings and will grow in either damp or well-drained situations.

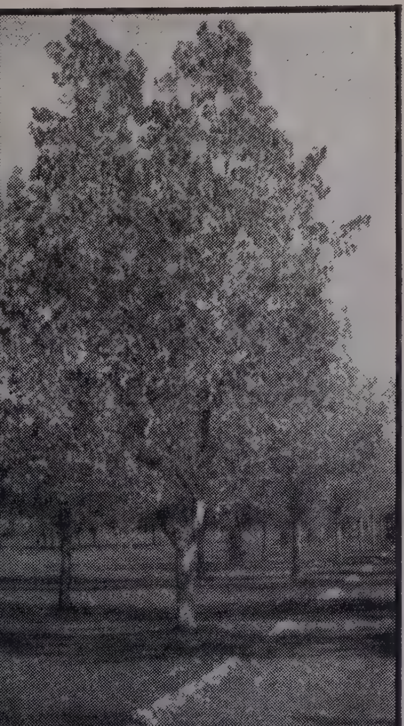
Golden-stemmed willow (*Salix vitellina*) is particularly attractive on margins of streams where it can be viewed from the driveway or windows. To obtain the best display the tops can be cut back each spring to give a mass of young wands in summer. In big gardens or country gardens where these trees can be planted over the fence if necessary they add greatly to the autumn effect, but in small gardens they would be quite out of the question.

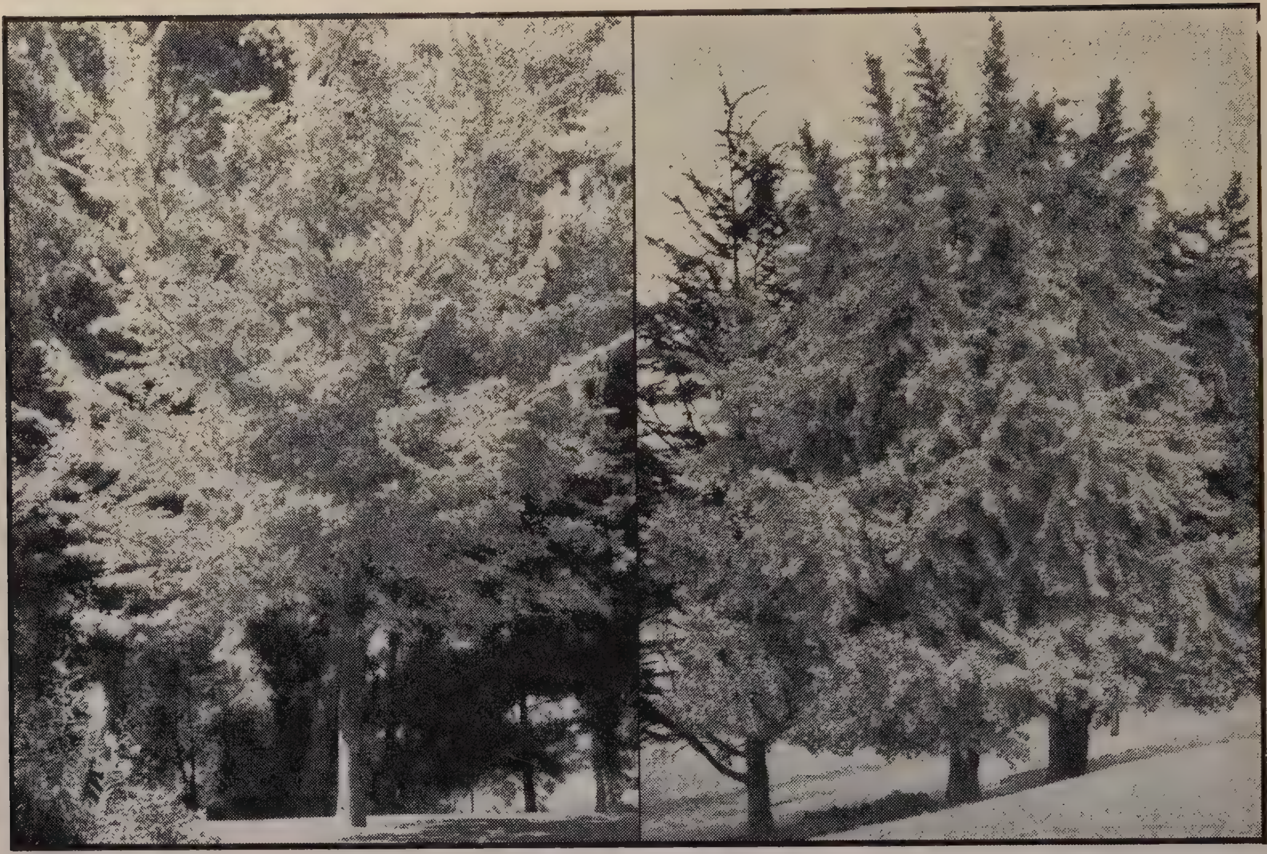
The ash (*Fraxinus excelsior*) grows well in damp situations, though it will not stand bogs or stagnant water.

Golden ash (*F. excelsior* var. *aurea*) makes an attractive lawn specimen of graceful habit and even its bare twigs in winter are quite effective with their fat, tight black buds. Both varieties are surface rooted, which makes cultivation impossible at their roots, and rain dripping from the dense leafy tops prevents the establishment of plants under them. These varieties are only suitable in larger gardens, but the claret ash (*Fraxinus raywoodi*), growing to a height of 20ft., is smaller. Its foliage turns a good red and gives quite a lengthy display.

The maidenhair tree (*Ginkgo biloba*) has been preserved and protected by the Chinese and Japanese, who regarded it as a sacred tree and cultivated it around their temples. The maidenhair tree is hardy and grows readily in a good, well-drained soil. It will stand the smoke and fumes of cities and it can be trimmed hard when necessary, but normally little pruning is needed. Growing to a height of 30ft. and with a good pyramidal shape when young, it is a good subject for planting on lawns or in driveways, and during autumn its unusual lobed leaves turn to clear gold.

The tulip tree (*Liriodendron tulipifera*) grows to a height of 50ft.





[*Douglas Elliott photos.*

Left—A good specimen tree of *Ulmus glabra variegata.* Right—A very old maidenhair tree, *Ginkgo biloba.*

and is suitable for drive plantings or lawn trees in larger gardens. Although it may take up to 15 years to produce its waxen flowers, the tree is always interesting for its fresh colour and unusually shaped leaves, which turn bright yellow in autumn. The orange-throated, tulip-shaped flowers are not conspicuous, but are attractive and useful in decorative work.

The silver birch (*Betula alba*) is well known and is particularly suitable for drives. Its white, papery bark contrasts with either its summer green or golden autumn foliage. As a single specimen tree or planted in groups of three or four it is equally effective, and it is also suitable for use as a hedge if kept lightly trimmed at 18ft. to 20ft.

There is a wide seedling variation of individual tree characteristics; some trees break into leaf early and other trees have a more upright habit.

Smoke bush (*Cotinus coggygria*, formerly *Rhus cotinus*) seldom is above 18ft. when fully grown. It makes a good screen planting and has fuzzy flowers in summer, which give it its common name. The leaves are fresh and green during spring and summer and in autumn turn orange and yellow.

Koelreuteria paniculata, said to have inspired the Chinese willow pattern, is a little-known tree of handsome foliage which turns clear yellow. It has a good, rounded head and grows to about 30ft. It is not particular as to soil, but prefers sunny positions and in early summer the large spikes of small, yellow flowers are quite effective.

Another uncommon tree worthy of more attention is *Parrotia persica.* The foliage is large and round and attractive at all seasons, particularly in autumn, when it turns a brilliant yellow. It grows to a height of 15ft. and eventually forms a spreading head of about the same width. The flowers are inconspicuous, but are interesting, being dark red and black with long, red stamens which dangle freely.

The Judas tree (*Cercis siliquastrum*), approximately 20ft. high, is well known for its bright pink flowers, which cluster along the bare stems and branches. It is a neat tree with spreading branches and rounded foliage which turns yellow in autumn. It seems to grow equally well in shade or sun. It will stand heavy cutting if necessary and can compete favourably with roots of other trees growing nearby.

Pearl bush (*Exochorda grandiflora*), grown for its display of white spring flowers, forms a neat round-headed shrub of 10ft. and its foliage is fresh and green all summer. The leaves turn yellow, but fall too quickly to make a really good display.

Leaves Turning Red

Trees well known for their dainty foliage and graceful habit of growth are maples (*Acer* spp.). Varieties of *Acer palmatum* range in height from 3ft. to 12ft. and give excellent autumn tints. The colours range through red and bronze and sometimes gold, but all through the season from early-spring growth onward the maple foliage is decorative in the garden and very useful in floral work. To look their best maples must be grown in a sheltered position protected from strong winds, which cause burning of the foliage and spoil the good shape of the trees.

June berry (*Amelanchier canadensis*) is a slender well-shaped tree growing 20ft. to 30ft. which does well in cold districts. In spring it is a mass of nodding 2in.-long white racemes of flowers and in autumn the leaves turn a distinct red.

Chinese quince (*Chaenomeles sinensis*) grows as a large, open bush and produces tight, pink buds which are slow to open, but unfold to flat, pale pink flowers and the large foliage gradually changes through the shades of yellow and bronze. The long sprays of flowers and foliage are excellent for picking and the large yellow fruits, which remain a long time on the bush, can be used in decorations or for making jelly.

Liquidambar styraciflua, a popular tree in both large and small gardens. prefers a slightly damp position and needs to be carefully handled at transplanting. Once established, it grows into a well-shaped tree. After its brilliant red and yellow leaves have fallen, its unusual corky bark is appreciated by those interested in winter decorations. Some newer kinds of *Liquidambar* are *L. montocola*, which is noted for yellow spring growth, and *L. formosana*, a low-growing variety of 10ft., of spreading habit, and slow growth. Any of the kinds of *Liquidambar* make good specimen trees and are excellent for drive plantings.

Two species of oak which could be used to greater advantage are the scarlet oak (*Quercus coccinea*) and the pin oak (*Q. palustris*). The scarlet oak grows slightly taller and will flourish in fairly dry conditions. The pin oak has finer cut leaves, is just under 50ft., and will grow in wet and heavy soils. Both trees have a good shape and brilliant red colouring. Grown by themselves against dark trees or green lawns or fields, they can be appreciated for their beauty of stature as well as their coloured foliage.

Nandina domestica is a slow-growing shrub which eventually reaches 4 or 5ft. Its foliage is stiff and fernlike. The young growing leaves are red and in autumn the older leaves turn a red-brown. As the shrub grows its stems lengthen, almost giving the impression of a group of bamboo stems. The stiff spikes of waxen flower buds are effective in the garden and are excellent for picking.

Sumacs are well known for their brilliant autumn display. *Rhus succedanea*, *R. verniciflua*, and *R. vernix* all have large pointed leaves and make an excellent show, but unfortunately these three varieties are all poisonous. When any part of these trees comes into contact with the skin it can form painful blisters or a violent irritating rash. As these trees are now thought to be the origin of many skin troubles, they are not recommended. Formerly they were used in many gardens. If it is desired to remove the trees, they should be cut down in winter, when they are dormant. When any of these trees are being cut out, care should be taken to ensure that the sap does not come in contact with the skin, as serious poisoning can result. All parts of the tree should be burnt immediately.

Brown, Purple, and Bronze Foliage

The Ghent and Mollis types of rhododendron, until recently known as azaleas, are grown mainly for the beauty of their scented spring flowers, but in autumn the leaves turn bronze and purple. If they are planted in the foreground of a shrub planting in partial shade with a cool moist root run, they give a long display.

Barberries are useful for berries, flowers, and foliage. *Berberis thunbergi* will form a good bush about 3ft. high and 4ft. or 5ft. in diameter. Its leaves in strong sunlight are soft brown and in autumn turn to deeper brown and purple.

Forsythias (*F. intermedia spectabilis* and *F. suspensa*), *F. suspensa* being of more drooping habit, are well known for their masses of yellow spring flowers, but at the end of the season the long, pointed leaves turn dark purple and brown.

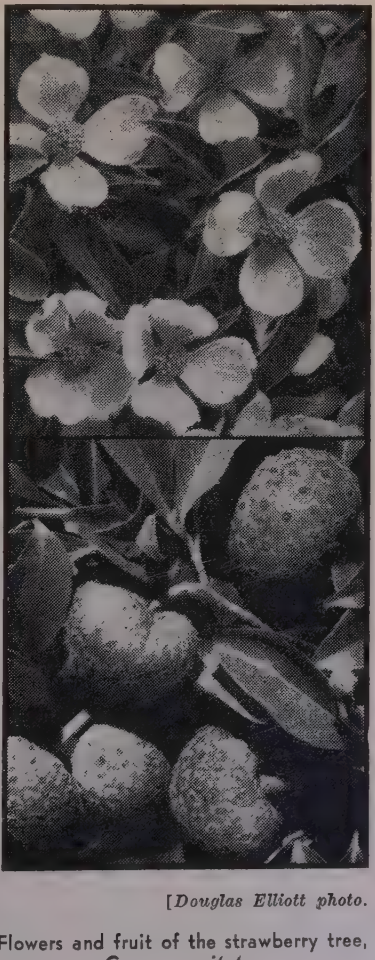
Shrubs for Berries, Fruit, and Leaf Colour

The strawberry tree, mentioned earlier, is approximately 20ft. high and is covered in spring with small flowers surrounded with large cream petal-like bracts. Later these are replaced by large strawberry fruits which remain on the tree until they are almost ripe. The fruits colour through all the shades of red and purple as they ripen and birds are very partial to them. Strawberry trees can be used for street and drive plantings, although the fallen fruit sometimes makes footpaths messy.

The spindleberry (*Euonymus europaeus*) is a popular berried tree growing from 7ft. to 10ft. high. When the fruits are ripe and the leaves turn the tree is an excellent subject for cutting. The clusters of fruit have pink-lobed cases showing the orange seed through them, and although the trees take up to 8 years for berries to come, they are well worth waiting for. Spindleberry trees will grow in a fair amount of shade, but plenty of room is necessary for root development. They make a satisfactory hedge if they are lightly trimmed. The fruit, flowers, and bark are poisonous.

[*Douglas Elliott photo.*

Golden ash (*Fraxinus excelsior*), an attractive lawn tree.



[*Douglas Elliott photo.*

Flowers and fruit of the strawberry tree, *Cornus capitata*.

A tree which has been slow to gain popularity is *Idesia polycarpa.* Possibly the reason for this is because one tree only was planted when, unless both kinds have been budded on to a tree, two trees are necessary to produce berries. There is a wide seedling variation in berry colours and it is advisable to buy plants known to be budded from a good strain. The large leaves, suspended on long, red stalks, are effective, but the bunches of bright red berries hanging on the bare stems are spectacular.

A red-berried shrub (*Stranvaesia davidiana*) grows to about 8ft., forms an upright bush, and has a few leaves which turn a brilliant scarlet and brighten it up considerably.

Climbers

Climbers can be used to advantage to shade verandas, clothe blank walls, or hide sheds and buildings. The brightest climber in autumn is the Virginian creeper (*Parthenocissus quinquefolia*). It supports itself with little suction pads.

Wisteria, grown mainly for its racemes of scented lavender flowers, and bignonia (Mme. Gallen), with bright orange trumpet flowers, also give a good display of yellow before leaf fall.

False bittersweet (*Celastrus scandens*) is a vigorous, hardy climber of the same family as *Euonymus*. It grows well in either sun or shade. As it often throws out a good many suckers, this factor should be allowed for when a site for it is being chosen.

Two plants were thought to be necessary for it to produce berries, but the plants are now considered self-fertile. Its vigorous habit makes it an excellent subject for covering large expanses of brick wall, and also for sloping banks which are difficult to manage. The clusters of bright, yellow-capped, red berries are very showy and persist on the plant for weeks. In decorative work the sprays of berries retain a good colour and last well.

Garden Work for May*

Annuals sown earlier for spring flowering should be thinned out to an inch or two apart as soon as they can be handled. Further thinning is necessary as the plants become larger, until they are finally thinned to 8 or 9in. apart by the time they are in flower. Annuals that have been raised in boxes from seed, or self-sown seedlings lifted from the borders, can still be planted out in vacant spaces in the borders in very mild districts, but elsewhere it is probably better not to plant these seedlings until the end of winter.

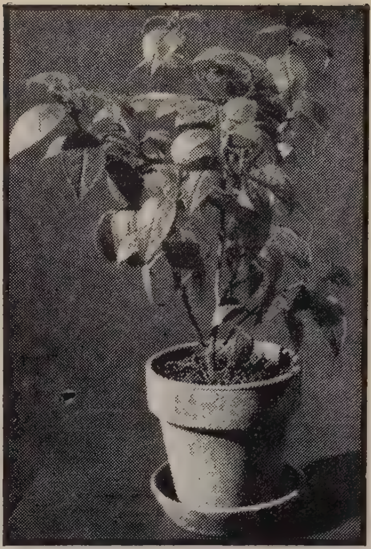
Cinerarias should be looked over from time to time. The "woolly bear" caterpillars that can devastate cinerarias later in the season can usually be kept down by hand picking at this time, but spraying with D.D.T. in spring and early summer is well worth while.

Cuttings will grow only if there is a sufficient but not over-supply of air to the cut surfaces, where the new roots will appear. Success with cuttings depends largely on the texture of the soil in which they are put to root. Soils such as those in many New Zealand gardens which "run together" when watered and then form a crust when they dry are unsuitable for cuttings, as they do not allow access to sufficient air. Cuttings in a pot, box, or frame have to be damped often to promote root development.

Now is the time, when the cold frame is more or less empty, to make sure that the texture of the soil in it is suitable for propagating. A liberal addition of coarse, gritty sand will do much to open the texture of the soil, prevent it from caking when watered, and so ensure a good supply of air to the bases of the cuttings to be propagated next season.

Dahlias left in the ground from the previous year produce the earliest blooms, but they cannot be left outdoors safely in districts which experience hard winters. Except in the mildest districts it is best to lift the roots and dry them off and then store them for the winter in any place where they will be protected from frost. They do not require a warm place, temperatures between 35 and 40 degrees F. being satisfactory. In relatively mild districts the tubers can be kept beneath an evergreen hedge if shed storage is not available.

In mild districts where it is customary to leave dahlia roots in the ground through the winter it is advisable to lift them in late winter at least every 3 years and divide the old roots or replant single tubers taken from the outside of the old clump, care being taken to ensure that each tuber has at least one bud on its neck.



Fuchsia plant after it has been "pinched". It now has 17 shoots which will flower in spring.

Dead flower heads should be removed regularly even in the winter if the borders are to be kept in flower for as long as possible. They should always be cut off with a knife or scissors or pinched off with the thumbnail and never pulled off, as pulling is likely to wrench the roots and may even result in some of the annuals being pulled out of the ground.

Deep digging does more than anything else to encourage the large, deep root systems which are necessary if plants are to grow well. Plants with shallow roots are sensitive to dry conditions when the surface soil dries out, whereas deep soils remain moist for much longer and roots can draw a constant supply of moisture from the deeper layers. In the mixed border there is less opportunity for deep digging than in the vegetable garden, but every opportunity should be taken of digging the borders, even though only small areas can be dug at a time. Digging in the autumn is especially beneficial, as the dug soil will absorb and store much of the winter rainfall and prevent run-off. To this end all hard surfaces should now be pricked lightly with a fork even if the ground is occupied and cannot be dug over. The aim should be never to let the ground become hard but to loosen the surface when it shows signs of caking.

Herbaceous plants in the borders should continue to be lifted, divided, and replanted after the digging and manuring of the site.

Planting time for most trees, shrubs, and herbaceous plants extends from about May to early October. The advantage of autumn planting is that the soil is still relatively warm after the summer and plants usually form new roots quickly. On the other hand winter storms are likely to rock shrubs and trees planted in autumn, as they will not have had time to produce new anchorage roots, and a very wet spell in winter will often kill newly planted stock outright if the soil is poorly drained and becomes waterlogged. In spring planting there is likely to be less trouble from waterlogging by heavy winter rains, but the plants will have less time in which to form deep root systems before the hot, dry summer weather. Spring planting is definitely better if the soil tends to be wet in winter.

Pot plants should be trained as bushy specimens and not allowed to become "leggy". Young fuchsias, balsams, and geraniums potted up as rooted cuttings to flower next year should be "pinched" several times as they grow to produce well-branched plants. "Pinching" means the removal of the tip of the shoot while it is still soft enough to be pinched off between the finger and thumbnail.

Sweet peas should be given as long a growing season as possible. In early districts where the site will be ready for planting by July or August seeds should be sown now in pots or boxes in a cold frame. They should be given quite hardy conditions and need the protection of the frame light only in really cold weather. Seeds are sown 1½in. apart and 1in. deep.

Pests and Diseases

Chrysanthemum plants are often affected by eelworm, which causes leaves to dry prematurely and shrivel. This pest can be controlled properly only by hot-water treatment of the stools in winter and by planting them in sterilised soil. Cuttings from plants treated in this way will be completely free from eelworm. If they are planted in soil not affected with eelworms, these plants will grow into healthy specimens retaining all their leaves to the ground.

Mildew on a variety of ornamental garden plants can best be controlled by a sulphur fungicide. The most effective method is to use a liquid spray combining lime sulphur and colloidal sulphur, but the disadvantage of sulphur sprays is that they discolour paint work and cannot be used safely near the house.

A fairly satisfactory method of combating all the common mildew diseases on flowering plants is to use sulphur in the form of a dust, either flowers of sulphur or a proprietary sulphur dust. Dusts are not as efficient as liquid sprays, but are reasonably effective if applied uniformly, preferably in the early morning when the plants are still damp with dew. One method of application is to put the dust in a piece of cheesecloth, tie the bundle to a stick, and shake the stick or tap it with another to drive off a small cloud of the dust. However, this is a wasteful method, and every home gardener will find that a hand duster is a good investment.

Spotted wilt virus disease which affects many plants, including tomatoes, is carried over from one year to the next on a variety of plants, especially on dahlias, lettuces, Iceland poppies, and nasturtiums. Dahlia roots marked earlier as virus infected and any of the plants named which show spots on the leaves or are stunted, malformed, or in any other way abnormal should be dug out and burnt. By destroying infected plants carrying over the disease from year to year there is at least some hope of reducing losses in next season's tomatoes.

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* This section has been prepared by C. K. Ellis, formerly Horticulturist, Department of Agriculture, Dunedin.

COFFEE

COFFEE has been used for many centuries, at first mainly as a stimulant rather than as a beverage or a flavouring extract. Only comparatively recently has it become an accepted beverage, and its use as a flavouring extract is even more recent. This article by Nell Macpherson, Field Officer in Rural Sociology, Department of Agriculture, Auckland, gives recipes using coffee for beverages, cakes, and desserts.

A NATIVE of Africa, the coffee shrub has been introduced by various methods into other countries and now the largest coffee producer in the world is Brazil. Coffee is so important to Brazil's finances that the Government controls the production and marketing of the bean. The main suppliers of the world's coffee are Brazil 97 per cent. and Java and Arabia 3 per cent.

The flavour of coffee depends on the variety of the shrub, the climate in which it is grown, the age of the berries at harvesting, the control of the roasting process, and the blending of the beans.

Adulteration of coffee and the selling of substitutes for it are extremely ancient practices, both of which, particularly the second, had a great vogue in Europe during the Napoleonic Wars. Some of the adulterants are chicory, acorns, parsnip roots, and dextrins. Adulterated coffee may be readily detected by the cold-water test, as pure coffee does not sink in cold water or discolour it; adulterants do.

Coffee is a stimulating beverage because of the caffeine (similar to tea's theine) it contains. Some people are sensitive to caffeine and over the past 150 years people have attempted to remove it from coffee without altering the flavour and aroma. The most successful of these was a German chemist, Roselius, who extracted caffeine from the unroasted beans. This decaffeinised coffee has become fairly popular in some countries.

Careful Making Required

Coffee requires careful making to develop the full flavour without becoming bitter, and to make this easier various makers have been developed, including the percolator and the vacuum and drip pots. Care should be taken to follow the instructions given with these. They may be made of glass, enamel, stainless steel. aluminium, or chromium plate. All utensils used for coffee making must be kept scrupulously clean, as the oils from the coffee may cling to the inside of the pot and turn rancid, ruining the delicate flavour of the coffee.

To make good coffee certain rules should be followed irrespective of the type of maker used:—

1. Good-quality coffee should be bought.
2. It should be bought as freshly ground as possible, in small quantities, and kept in an airtight container.
3. It should never be allowed to boil, as this makes it bitter.

Quantities used vary according to taste, but the following proportions may be useful.

Weak coffee: 1 tablespoon of ground coffee to 1 breakfastcup of water.

Medium coffee: 2 tablespoons of ground coffee to 1 breakfastcup of water.

Strong coffee: 3 tablespoons of ground coffee to 1 breakfastcup of water.

After-dinner coffee: 4 tablespoons of ground coffee to 1 breakfastcup of water.

One breakfastcup of coffee infusion will make two cups of coffee or four after-dinner (demi-tasse) cups. Coffee may be served black with sugar and cream, or with hot milk (au lait), or whipped cream or ice cream may be served with iced coffee.

Beverages

Steeped Coffee

1 tablespoon of medium ground coffee
Pinch of salt
1 cup of cold water

Mix the ingredients together and bring them to the boil; set aside for 5 to 7 minutes in a warm place; strain into a heated coffee pot. A saucepan is used in this method. If large quantities are to be made, part of the water can be heated first for speed.

Coffee should be clear and clearing is done in either of the following ways:—

1. Add 1 tablespoon of cold water 1 or 2 minutes before straining the coffee.

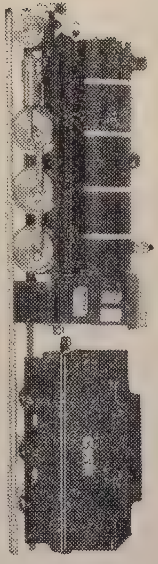
2. Add some crushed egg-shell or a little egg white to the coffee before heating. Strain it out with the grounds just before serving.

Drip Coffee

1 tablespoon of finely ground coffee
Pinch of salt
1 cup of boiling water

Put the coffee and salt in the strainer and pour the water slowly through. For stronger coffee the water may be run through twice, though the flavour is often not so attractive.

STEAM LOCO



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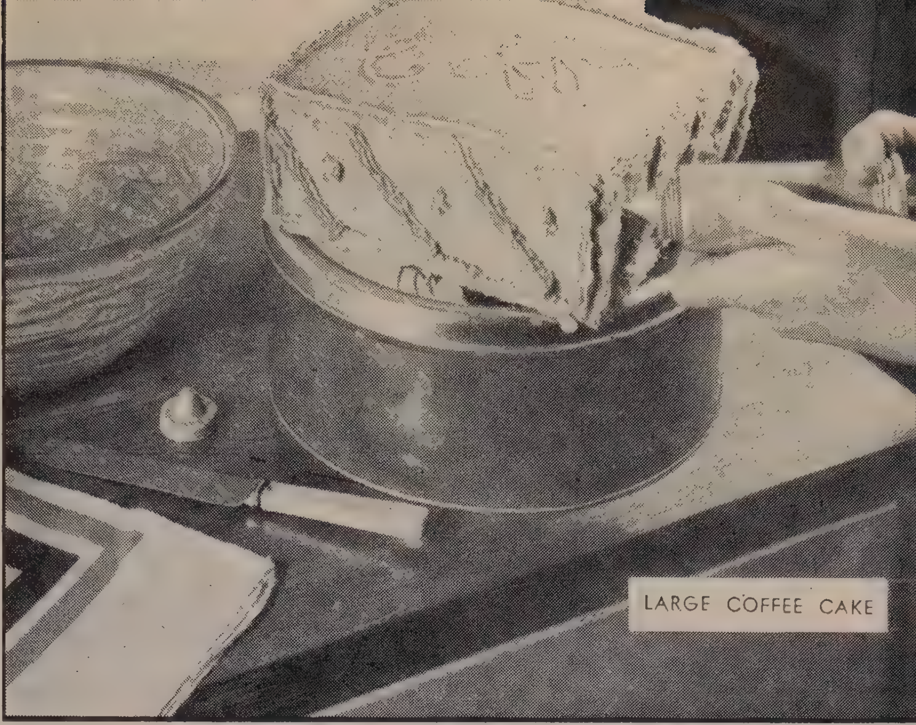
387—COFFEE CAKES . . .



LARGE COFFEE CAKE

Percolated Coffee

1 tablespoon of medium ground coffee
Pinch of salt
1 cup of water

Place the coffee and salt in the strainer of the pot with water below. Heat and let the water percolate slowly, for 5 to 7 minutes, through the coffee until the desired strength is obtained.

After-dinner Coffee

Make the coffee by any of the above methods and serve with cream and sugar.

White Coffee (Cafe au Lait)

Make medium-strength coffee. Serve with an equal quantity of hot but not boiled milk.

Iced Coffee

Half fill tall glasses with cracked ice or ice cubes. Fill the glasses with strong, freshly made hot coffee. Add cream, whipped cream and sugar, or ice cream.

Instant Coffee

A preparation now on the market is a powder made from solids extracted from coffee. It sometimes has dextrins added. This will dissolve in either hot milk or hot water and makes a very pleasant drink. Use 1 teaspoon per cup of milk for white coffee or ½ teaspoon per cup of water for black coffee.

Bought sweetened coffee extract is the most common flavouring, but where a recipe states coffee infusion, unsweetened coffee is used to preserve the balance of sugar to the other ingredients.

Large Cakes

Coffee Cake

¼lb. of butter
½lb. of sugar
3 eggs
½lb. of flour
3 tablespoons of milk
1 teaspoon of baking powder
2 tablespoons of sweetened coffee extract

Cream the butter and sugar. Add the eggs separately and beat each into the mixture. Add the flour and baking powder sifted together and fold in. Lastly add the coffee essence in the warmed milk and stir in. Bake in a loaf tin or deep tin for 45 minutes at 375 degrees F. Two tablespoons of finely chopped cherries may be folded in with the flour if desired.

Mocha Cake

3 eggs
Weight of eggs in sugar and flour (usually 6oz.)
½ teaspoon of vanilla essence
3oz. of butter
1 teaspoon of baking powder
2 tablespoons of coffee infusion

Cream the butter and sugar and add the lightly beaten eggs. Sift the flour and baking powder together and add this mixture alternately with the coffee infusion, starting and finishing with flour. Add the vanilla essence. Bake in a greased tin for 35 to 40 minutes at 375 degrees F. Cover the cake with coffee butter icing.

LACK OR AFTER-DINNER COFFEE

Eggless Coffee Cake

4oz. of butter
1 cup of sugar
½ cup of treacle
1 cup of strong coffee infusion
½ cup of raisins
2 cups of flour
2 teaspoons of baking powder
1 dessertspoon of ground ginger
1 dessertspoon of spice
¼ cup of lemon peel

Cream the butter and sugar and add the treacle melted in the warmed coffee infusion. Sift the dry ingredients into the mixture and fold them in. Then add the fruit and mix thoroughly. Bake in a greased loaf tin or deep tin for 2 hours at 375 degrees F.

Coffee Butter Cake

3oz. of butter
6oz. of sugar
3 eggs
Pinch of salt
1 bare teaspoon of baking powder
4½oz. of flour
1½oz. of cornflour
1 dessertspoon of coffee essence
1½ tablespoons of milk

Cream the butter and sugar and add the eggs beaten with the salt. Sift the flour, cornflour, and baking powder into the mixture and fold it in. Mix the milk and coffee essence and stir in. Pour into greased, floured sandwich tins and bake for 20 minutes at 375 degrees F. When cooked the cake can be filled with whipped cream and jam or with the coffee filling described on page 390.

Small Cakes

Coffee Drops

2oz. of butter
2oz. of sugar
2oz. of flour
2oz. of ground rice
½ teaspoon of baking powder
1 egg
1 teaspoon of vanilla
1 dessertspoon of coffee essence
1 tablespoon of milk

Beat the butter and sugar to a cream. Beat in the egg, vanilla, coffee essence, and milk. Sift the flour, ground rice, and baking powder into the mixture and fold them in. Drop the mixture in spoonfuls on a greased oven slide and bake for 5 to 10 minutes at 375 degrees F. Join with jam, cream, or coffee filling when cold.

Coffee Tartlets

½lb. of pastry
Jam
3oz. of sugar
1oz. of butter
Pinch of salt
1 egg
2 dessertspoons of coffee infusion

Home Cooking — Recipes that appeal

SPONGE SANDWICH

3 eggs, 4oz. sugar, 1oz. flour, 2oz. **Edmonds Maize Cornflour,** 1 teaspoon **Edmonds Baking Powder** ("Sure-to-Rise" or Acto), 1oz. melted butter.

Beat eggs and sugar until thick and fold in sifted dry ingredients then add melted butter. Put into 2 sandwich tins (8 inches) which have been greased and floured. Bake 20 minutes in moderate oven (375 deg. F.).

MOCK CREAM FILLING

1½ teaspoons **Edmonds Maize Cornflour,** 2 tablespoons icing sugar, ½ cup milk, 2 tablespoons butter.
Mix cornflour and milk together into a smooth paste then boil 3 or 4 minutes. Cream butter and sugar and then add cornflour gradually when cold. Beat well. Flavouring may be added.

MELROSE CREAM

Equal quantities of custard made with **Edmonds Custard Powder,** and liquid jelly made with **Edmonds Jelly Crystals.** Mix together and put into mould to set. An attractive dish can be made by surrounding the above with different coloured jellies from small moulds (Egg cups will do).

VELVET PUDDING

2 cups milk, 2 dessertspoons **Edmonds Custard Powder,** 2 eggs, 1 dessertspoon butter, 4 tablespoons sugar.
Mix custard powder with a little of the milk and stir in the egg yolks. Heat remainder of the milk, pour in the mixture, add butter, cook 5 minutes, then pour into a piedish. Beat egg whites stiff, add sugar and pile on top. Brown in a cool oven.

ORANGE SNOW

Make up two separate jellies, using one packet each of orange and raspberry **Edmonds Jelly Crystals.** When orange is nearly set whip whites of two eggs to a stiff froth, add to jelly and whip for about ten minutes till light and feathery. Put away in dish in cool place to set. Decorate with the raspberry jelly and serve.

PRODUCTS OF T. J. EDMONDS LTD., CHRISTCHURCH.

Beat the egg and salt together and gradually beat in the sugar until the mixture is light and fluffy. Melt the butter and add it and the coffee infusion to the egg mixture. Beat thoroughly to mix. Roll out the pastry and line patty tins with it. Put a dab of jam on each tartlet. Fill the tartlets two-thirds with the egg mixture. Bake for 10 to 15 minutes at 400 degrees F.

Coffee Shortbread Fingers

12oz. of flour
4oz. of sugar
1 teaspoon of cream of tartar
6oz. of butter
2 eggs
½ teaspoon of baking soda
2 tablespoons of coffee essence

Sift the dry ingredients together. Rub in the butter until the mixture has the texture of fine breadcrumbs. Beat the eggs and coffee essence together and add them to the mixture. Either run the mixture through a biscuit forcer on to a greased slide or roll it thinly and cut it into fingers. Bake at 375 degrees F. for 20 minutes.

Coffee Biscuits

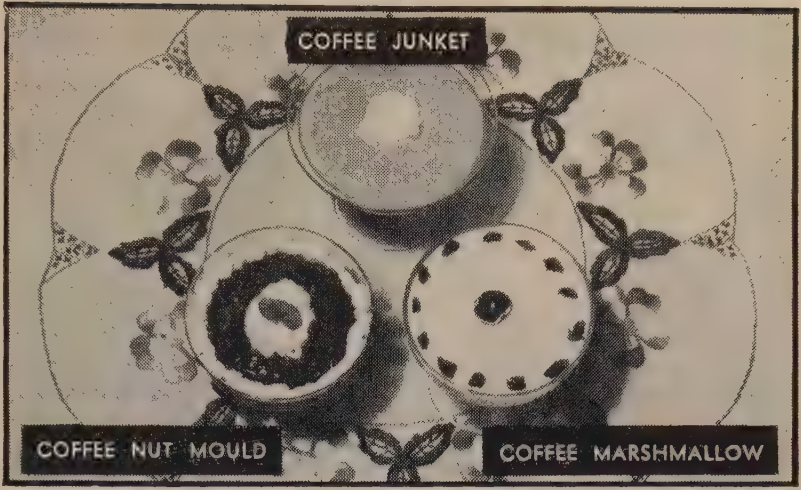
½ cup of sugar
4oz. of butter
1 egg
1 tablespoon of coffee essence
Milk if necessary
1½ cups of flour
½ cup of rolled oats
1 teaspoon of cream of tartar
½ teaspoon of baking soda

Cream the butter and sugar and beat in the egg and coffee essence. Sift the flour, baking soda, and cream of tartar into the mixture, add the rolled oats, and mix thoroughly. If the mixture will not bind, add a little milk. Turn the dough on to a floured board and roll it into a cylinder. Cut off thin slices and place them on a cold greased slide. Bake for 20 minutes at 375 degrees F.

Coffee Creams

½ cup of sugar
4oz. of butter
1 tablespoon of coffee essence
1 egg well beaten
2 cups of flour
2 teaspoons of baking powder
2 tablespoons of chopped nuts

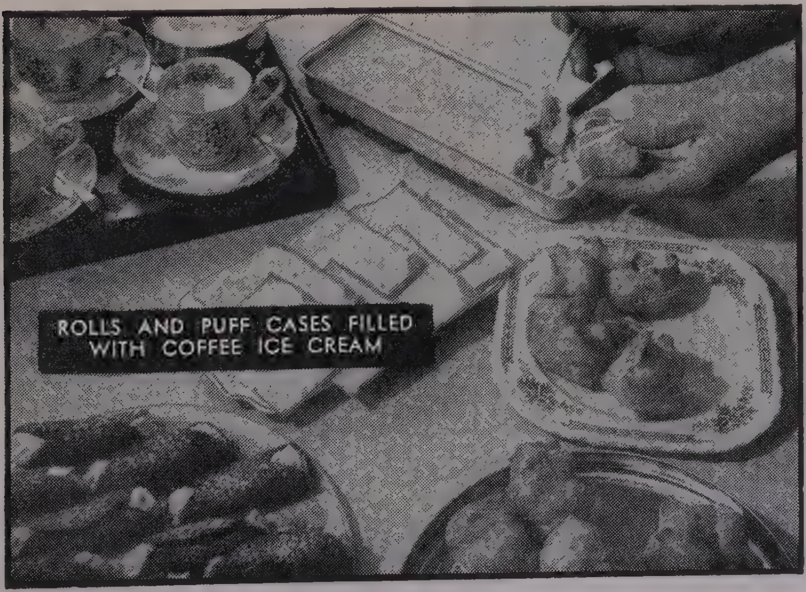
Put aside 1 tablespoon of beaten egg. Cream the butter and sugar and add the coffee essence and the remainder of the beaten egg. Sift the flour and baking powder into the mixture and mix thoroughly. Roll out the dough and cut it into fairly thick biscuits. Brush the tops of the biscuits with the beaten egg which was set aside and sprinkle with the chopped nuts. Bake on a greased slide at 375 degrees F. for 20 minutes.



Coffee Rolls

2 eggs
½ cup of sugar
¾ cup of flour
1 teaspoon of cream of tartar
½ teaspoon of baking soda
Pinch of salt
1 tablespoon of coffee essence

Beat the sugar and eggs until they are thick and foamy. Add the coffee essence and mix well. Add the dry ingredients sifted together and fold in lightly. Drop teaspoonfuls on a cold greased slide and bake for 5 minutes at 400 degrees F. While the pieces are still hot roll the sides to the middle. Place them under a cake rack until they set in shape. Fill with whipped cream.



ROLLS AND PUFF CASES FILLED WITH COFFEE ICE CREAM

Cold Desserts

Coffee Junket

1 cup of milk
½ teaspoon of rennet
1 teaspoon of coffee essence or infusion

Warm the milk and coffee essence and pour them on to the rennet. When the junket has set garnish it with whipped cream. (1 serving.)

Coffee Nut Mould

1 cup of boiling water
1 teaspoon of coffee essence
1 tablespoon of chopped nuts
1 teaspoon of cornflour

Mix the cornflour to a thick cream with a little cold water. Add the coffee essence to the boiling water and pour these into the cornflour mixture. Heat the mixture till it boils and boil rapidly for 5 to 7 minutes, stirring all the time. Add the chopped nuts. Allow the mixture to cool slightly and pour it into a glass. When it is cold garnish it with whipped cream and ½ walnut. (1 serving.)

Coffee Marshmallow

½oz. of gelatine
1lb. of sugar
1 tablespoon of coffee infusion

Soak the gelatine in a bare half-cup of water for ½ hour. Soak the sugar in a bare half-cup of water for ¼ hour, bring it to the boil, and boil for 5 minutes. Add the gelatine mixture and simmer it for 5 minutes; it must not boil. Add the coffee infusion and allow the mixture to cool a little. Beat the mixture until it is thick and the marshmallow stands in little peaks. Pile the marshmallow into dishes and allow it to set. Garnish with glace cherries or coloured coconut. (4 to 6 servings.)

As this dessert is very sweet, a spoonful of tart fruit may be placed at the bottom of the dish and the marshmallow piled on it.

Coffee Cream

1 pint of coffee infusion (use 6 tablespoons of ground coffee)
1oz. of gelatine
10oz. of sugar
1 pint of unsweetened whipped cream

Soak the gelatine in the coffee for ½ hour. Add the sugar and bring to the boil, stirring well. Pour the mixture into a bowl and when it begins to set fold in the whipped cream. (6 servings.)

Coffee Spanish Cream

1½ cups of coffee infusion
½ cup of milk
⅔ cup of sugar
¼ teaspoon of salt
1 tablespoon of gelatine
3 eggs
½ teaspoon of vanilla

Mix the coffee, milk, gelatine, and half of the sugar and heat them in a double boiler over water. Separate the egg whites and yolks and beat the yolks, salt, and the remainder of the sugar together and add the hot mixture to this, stirring carefully. Return the mixture to the double boiler and cook it gently until it coats the spoon. Fold in the stiffly beaten egg whites and vanilla and turn the mixture into a wet mould. Chill the mixture. To serve unmould the spanish cream and garnish it with whipped cream or custard. (6 servings.)

Hot Puddings

Coffee Bread Pudding

2 cups of stale breadcrumbs
1 quart of milk
4 tablespoons of ground coffee
2oz. of melted butter
½ teaspoon of salt
2 eggs
¼ teaspoon of spice
½ cup of sugar

Heat the coffee and milk till they boil and then strain the mixture on to the breadcrumbs; allow the crumbs to soak for ¼ hour. Beat the remaining ingredients together and stir this mixture into the breadcrumb mixture. Turn the mixture into a buttered pie-dish and set the pie-dish in a pan of boiling water. Bake the pudding for ¾ hour at 325 degrees F. Serve with apple sauce if desired. (6 servings.)

Steamed Coffee Pudding

3oz. of butter
3oz. of sugar
6oz. of flour
1 egg
1 bare teaspoon of baking powder
2 tablespoons of coffee infusion

Cream the butter and sugar and add the egg beaten in the coffee infusion. Sift the flour and baking powder together and fold them in. If the mixture is too stiff to drop from a spoon, add a little more coffee. Turn the mixture into a greased bowl, cover it, and steam it for 1½ hours. Serve with a custard sauce. (6 to 8 servings.)

Coffee Tart

¼lb. of short pastry
2 tablespoons of stewed fruit or jam
1 dessertspoon of coffee essence
1 cup of milk
1 dessertspoon of cornflour
1 tablespoon of butter

Line a pie plate or sandwich tin with the pastry and bake it. Spread the pastry with the jam or stewed fruit, which must not be too moist. Mix the cornflour to a thin paste with a little cold water. Heat the milk, coffee essence, and butter together and pour this mixture into the cornflour mixture. Return the mixture to the heat and cook it, stirring all the time until it is thick and starts to leave the side of the pan, which should happen in 5 minutes. Pile the cooked mixture on to the pastry. (6 to 8 servings.)

Miscellaneous Recipes

Coffee Filling

1 dessertspoon of coffee essence
1 dessertspoon of cornflour
1 cup of milk
1 tablespoon of butter

Mix the cornflour to a thin paste with a little cold water. Heat the milk, coffee essence, and butter together and pour this mixture on to the cornflour mixture. Return the mixture to the heat and cook it for 5 minutes, stirring all the time. This is a good filling for sponge sandwiches and eclairs or puffs.

Coffee Ice Cream

2 teaspoons of gelatine
4 teaspoons of instant coffee
½ cup of sugar
Pinch of salt
1 cup of milk
2 cups of cream
½ teaspoon of vanilla

Put the gelatine, instant coffee, salt, sugar, and milk in a saucepan. Heat gently, stirring constantly until the gelatine is dissolved, which should happen in 2 to 3 minutes. Cool the mixture. Add the cream and vanilla and mix well. Turn the mixture into a freezing tray and freeze it until it is solid for ¼in. round the edges of the tray. Turn it into a bowl and beat until it doubles its volume. Return the mixture to the tray and freeze it until it is solid.

This ice cream is a nice dessert with stewed fruit, or it may be used as a filling for ice-cream puffs for afternoon tea.

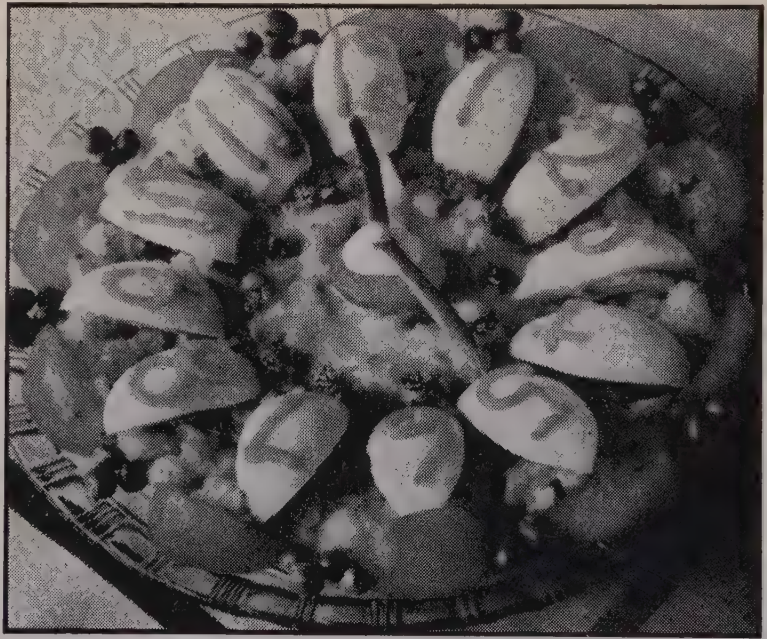
Coffee Icing

2 tablespoons of strong coffee infusion or coffee extract
2 tablespoons of butter
4oz. of icing sugar

Cream the butter. Add the icing sugar and mix well until smooth. Add the coffee slowly and beat it in well.

All photographs by Sparrow Industrial Pictures Ltd.

Salad Clock, a Party Dish



FOR a party an attractive dish is salad clock, the dish illustrated, for which the ingredients are 3 hard-boiled eggs, 1½lb. of potatoes, salad cream, a few tinned peas, ½lb. of tomatoes, 1 teaspoon of chopped parsley, and a little cochineal or tomato colouring.

Boil the potatoes until just cooked, cut into medium-sized squares and when cold mix with salad cream. A few peas can be added if liked. Spread on a plate, having the mixture raised slightly in the centre, and sprinkle with the chopped parsley.

Cut the hard-boiled eggs into quarters and lay them round the edge of the potato salad in the position of clock figures.

Cut the tomatoes down into halves, and then each half into three. Decorate the edge of the clock with these, alternated with little piles of peas to get a scalloped effect. Cut the top off a tomato and lay it in the centre.

Hands can be made of strips cut from cucumber, marrow, potato skin, etc. Stick them to the tomato centre with a dab of salad cream.

The figures on the clock can be made by cutting them in the eggs and filling with tomato sauce or, as in the photograph, by reserving a little of the potato, sieving it, mixing it with a little milk until quite soft, colouring it with tomato or cochineal colouring, and forcing it on to the eggs.

Choice and Care of Brushes

By ELEANOR COUSTON, Field Officer in Rural Sociology, Department of Agriculture, Timaru

THE right tool for the job should always be the objective when new equipment is being bought for the house, and a variety of brushware suited to requirements is essential in every home. New brooms may not sweep clean if made from poor fibre, and a clear idea of what to look for when selecting from the wide range of sizes, shapes, and different-quality brushes available should help the housewife in making her choice.

FROM early times, when sweeping was done with branches of trees or shrubs tied together with vines, brushware has progressed to a stage where there are styles and types for a multitude of uses. Apart from the more familiar varieties, there are the huge brushes used for road-making machines, brushes for finger-print powder used by the police, gas-washing brushes for municipal gas plants, and even little decorative Christmas trees are made from bottle brushes dyed green.

Probably the first brush or broom made for trade was the besom, which was a long-handled broom made from twigs. The making of these started as a home industry and the products were hawked through the country by such people as the gipsies. Bunches of suitable fibres were also used for hand scrubbing until the idea was evolved of using a flat piece of wood with the grass or fibre held in a series of holes by wire, pitch, or some type of gum. With the coming of the industrial age the hand methods of wire and pitch setting became too slow and machines were invented to speed up production. Automatic machines now turn out hundreds of brushes daily with each knot of fibre firmly attached by a staple within the holes of the board or stock. The older methods of wire drawing and pitch setting are still sometimes used, but stapling of knots is now more general.

Hair or bristle should be deeply set and preferably fastened by wire or staple.

Good pitch is satisfactory for brushware for dry use, but it is inadvisable to buy brushware set with glue, as the fibres loosen readily and drop out.

Type to Suit Purpose

Modern brushware may be made from bristle, hair, bass, whalebone, steel wire, millet, or nylon, and it is important to be able to distinguish between these and to know which type suits which purpose. The finer the work is the finer should be the hair or bristle used. Fine red sable from the tail of the kolinsky and "camel hair", which is obtained, not from the camel, but from a species of squirrel, are the most desirable for artists' brushes. For the broom for the yard strong, thick bass is used.

Bristle

Bristle, which is obtained from pigs, can be distinguished from hair by a characteristic forking at the end. It is said that it takes a Chinese pig its entire lifetime to produce sufficient bristle for one paint brush. For quality in household brooms bristle ranks very high, but is now rarely seen except in paint, varnish, shaving, or toilet brushware. It is, however, sometimes possible to find bristle brushes similar to the turk's head, for ceilings and walls, and the moulder's brush, which is also useful for sweeping flour or crumbs from the baking board, shown in the top illustration on page 393.

Bristle combined with hair also makes a good broom, the bristle lending resilience and ensuring longer service than an all-hair brush.

A closely tufted hair broom will, however, give satisfactory service provided it is well cared for, and it is preferable to the cheaper type of fibre broom. Bristle is most desirable for hearth brushes, but if bristle is unobtainable, a good hair brush is superior to its counterpart in fibre.

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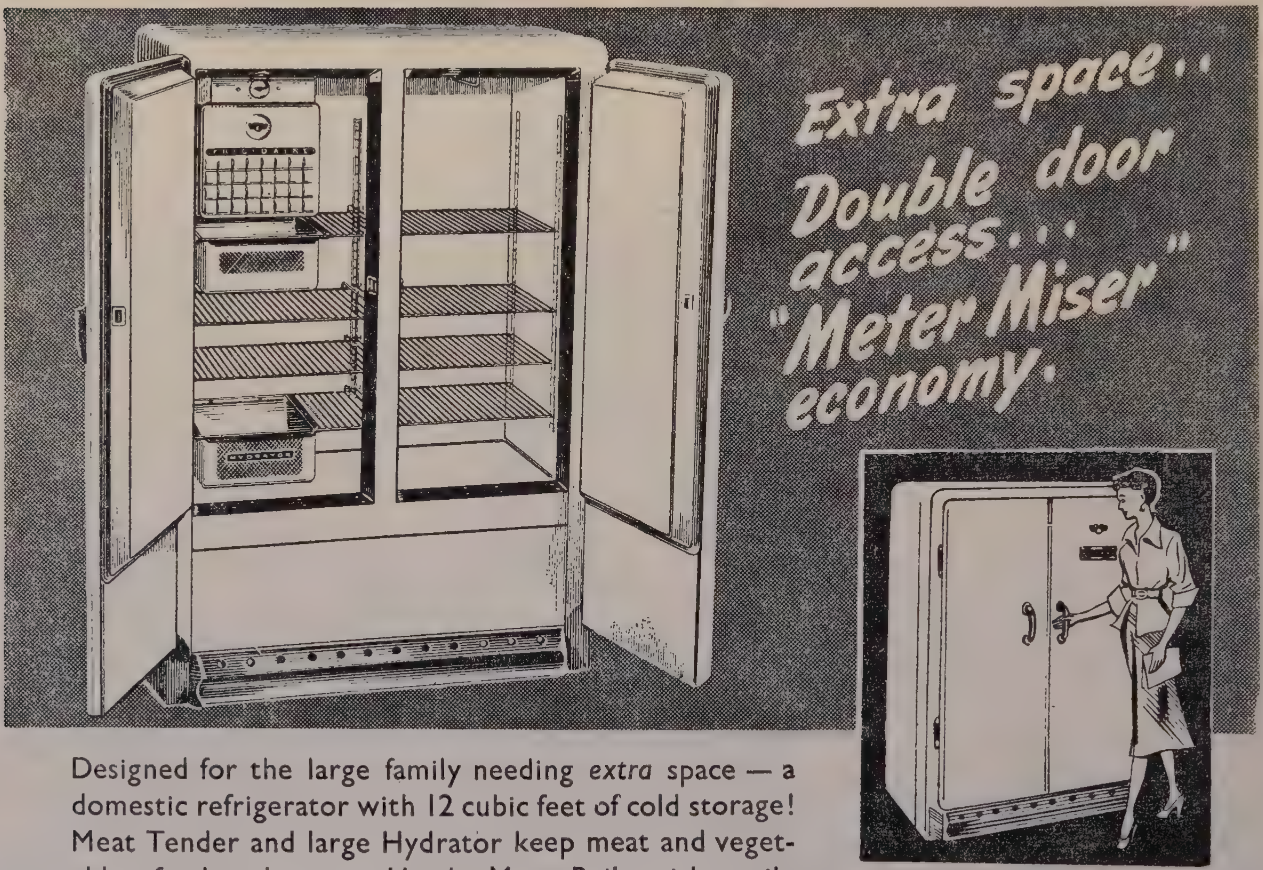
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Hair

Horse or cow hair is the commonest type used in brush manufacture, but finer types such as goat, badger, bear, skunk, or squirrel are used where softness is essential. This applies to crumb brushes or the soft hair brushes used for cleaning lampshades or delicate upholstery.

Fibre

Fibre, from the fleshy leaves of the cactus or from various types of palms, varies considerably in quality and thickness. The heavy type of fibre is used for stable and yard brooms, medium for scrubbing brushes, and soft for nail brushes. Price can be a fairly reliable guide when choosing fibre brushware, the fibres most used for scrubbing brushes being bassine, light union which is a popular mixture of bassine and white fibre, and Java. Light union, which is cheapest, is satisfactory for household scrubs, and the better-quality Java is more popular for dairy scrubs. The shape of a scrubbing brush will vary according to its use, but one with a closely tufted wing end will reach into corners and is best for general scrubbing.

Whalebone

Whalebone, which comes from a plate in the mouth of the whale through which sea water is expelled, is used for sweeps' heads, but has no domestic application other than for the finer type of dandy brush. Whalebone is pliable and long wearing and excellent for this purpose.

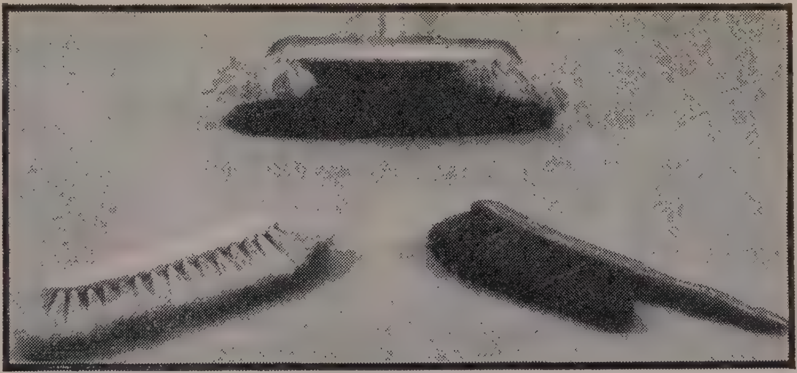
Nylon

Nylon, which is produced from coal, air, and water, is very tough, pliable, and water resistent, and its use is rapidly increasing for hair, nail, and tooth brushes. It can often be used as a good substitute for bristle and can be distinguished by its translucent appearance. Doubtless further domestic uses will be found in the future for brushware of this material and already hearth and bottle brushes are being manufactured.

Millet

Millet stalks, which are obtained from a crop, are used for corn brooms, whisks, and carpet banisters. Where vacuum cleaners are not in use the corn broom is of value for cleaning carpets and the whisk for upholstered furniture.

Left—A turk's head (upper) and a moulder's brush (lower) of bristle, which is resilient and long wearing, but now rarely seen in domestic brushware. Right—Millet brushes. A stiff carpet banister brush for stair or fitted carpets (left) and a corn whisk (right) for upholstery.



Hair broom and brushes. Closely tufted broom (upper), baker's brush (lower left), and banister brush (lower right). Good-quality hair brushware will give long service.

Fibre brushware. At left—Good-quality bass broom for carpets (A), three pot scrubs of different types (B, C, E), and small scrubbing brush suitable for vegetable preparation (D). Above—Hearth brushes and bottle brush of nylon.

Steel Wire

Steel wire is used for heavy-duty brushware, but has little application in the home.

Brushes for the Home

Although requirement will vary, depending on the type of home and furnishing and on what other facilities such as vacuum cleaner or carpet sweeper are available, most of the following brushes will find a place in the average home:—

For Washing up

A saucepan brush of the round-headed type or a sink scrub will facilitate easy cleaning and save the hands. A steel wire brush is useful where heavy iron pans are used, but is too harsh for aluminium or enamel.

A vegetable brush is invaluable for scrubbing potatoes, new carrots, celery, and other vegetables. A small scrubbing brush is best for this purpose and must be reserved for vegetables.

Bottle brushes of varying sizes for cleaning bottles and teapot spouts.

A medium-sized scrubbing brush for wooden benches.

For Preparation Work

A pastry brush, which may be either flat, round, or with a ferrule.

A soft bristle or hair brush, though not essential, can be useful for sweeping flour or crumbs from the pastry board.

For Household Cleaning

A good-quality bristle or hair broom; a fibre broom is less suitable for sweeping linoleum or polished surfaces.

A hearth brush of bristle, hair, good-quality fibre, or nylon.

A long-handled deck scrub and mop, if large surfaces are to be scrubbed. These can be great savers of time and energy. The newer type of mop, which is made from synthetic sponge, comes with a self-wringing device which can be attached to the bucket.

A scrubbing brush, preferably winged, for small areas.

A turk's head for cornices and ceilings.

A silver brush for embossed silverware.

A set of brushes for the grate and flues.

A dry mop for polished surfaces.

A two-pronged, short-handled mop for banisters, radiators, and skirting boards.

A small two-pronged mop for dusting Venetian blinds.

Where no vacuum cleaner is available the list should include a corn or good-quality bass broom for carpets; a short-handled, good-quality bass brush for stairs, the sides of fitted carpets, or heavier types of upholstery (a millet whisk may also be used); a paint brush for cleaning wire woves and mattresses; and a soft hair brush for delicate upholstery and lamp-shades.

For the Bathroom

A lavatory brush, designed for the purpose.

Simple fittings for brooms and mops can be attached to the back of a door.

A soft fibre brush for cleaning the bath.

Outside

A yard broom of good-quality bass.

A combined mop and squeegee for windows.

Vacuum Cleaning Attachments

Efficient use of vacuum cleaning attachments can greatly reduce the need for other specialised tools, but frequently second-hand cleaners that appear in salerooms have attachments that have scarcely been used. Attachments are designed not only for carpets but for all types of floors and will also clean upholstery, woodwork, bedding, and wickerwork. They can be used for cleaning drawers, cupboards, crumbs from toasters, and many other awkward corners. Many of these attachments are a form of brushware and require the same attention and care as other brushes. Similarly, carpet sweeper brushes require regular cleaning and adjustment.

Care of Brushware

The effects of standing brooms on their heads can be very damaging and their life will be prolonged if they are well hung. Most modern homes are provided with a broom cupboard, but where none exists a fixture can be made on the back of a door, on a wall, or perhaps in the space under stairs. The window mop and the turk's head, which are long and less frequently used, can be stored in the laundry on suitable brackets.

Mops or brushes used for wet work should be thoroughly rinsed and when possible hung in the sun to dry. They will quickly acquire a musty smell if stored while wet. Long-handled brooms should be placed in racks heads uppermost and shorter ones suspended by string passed through the handles.

Cleaning

No broom or mop will work efficiently unless it is kept clean. After each use fluff and dust should be removed, and although frequent washing is not recommended, the following methods can be used when necessary:—

Hair brooms: Remove fluff and dust by shaking or by inserting a skewer between the tufts; then run the broom under cold water to loosen the dust. Beat it up and down in warm soapy water, rinse in warm water, and then in cold to set the bristles. Soapless detergents may also be used, preferably with the addition of a small amount of olive oil to keep the bristles soft and pliable. Shake the broom well and dry by hanging it with the bristles down in an airy place. This can be done by suspending it from a clothes line, by catching the broom handle in the sash of a window, or by resting it over the rungs of a clothes horse.

Fibre, bass, and corn brooms: These can be washed in the same way as soft brooms, but should be given a final rinse in cold water to which salt has been added in the proportion of 1 tablespoon of salt to 1 quart of water. As millet is not very water resistant, corn brooms should not be washed frequently.

Carpet sweeper brushes: The brushes in the carpet sweeper require regular attention, and after hairs have been removed from the shank the brushes should be washed in the same way as hair brooms. Brush attachments for vacuum cleaners and electric polishers also require cleaning, and soapless detergents may be used, or soapy water as for hair brooms.

Lavatory brushes: These require frequent washing in disinfectant solution and hanging in the sun to dry.

Precautions

The handle of any brush or broom should not be soaked in water and the backs of hair brushes can be protected by smearing them with a little petroleum jelly before washing.

Whenever possible, brushware should be washed by beating it up and down, rinsing well, and shaking to remove as much water as possible. Drying should be done with the brush suspended and the bristles down.

Adequate care of all equipment brings its own reward, and an orderly broom cupboard may well reflect the efficiency of the housewife.

Cap-sleeved Blouse

KNITTING cottons in many lovely shades are available at present, and a knitted cotton blouse to wear with a skirt or under a suit is a very useful garment. Unlike a woollen jumper it can be washed frequently without fear of its shrinking or losing its shape.

MATERIALS required for the cap-sleeved cotton blouse illustrated are three 2oz. balls of No. 8 knitting cotton, 2 No. 13 and 2 No. 11 knitting needles, 7 buttons, and crochet hook.

Measurements: Length 20in.; to fit 34 to 36in. bust.

Tension: 7½ st. measure 1in.

Abbreviations: K. knit, p. purl, st. stitch(es), rep. repeat, tog. together, inc. increase, cont. continue, patt. pattern, w. fd., wool forward.

Work st. in brackets to the extent stated after second bracket.

Left Front

With No. 13 needles cast on 62 st.

First and second rows: (K. 1, p. 1) to end.

Third and fourth rows: (P. 1, k. 1) to end.

Keeping the double moss st. at front border and side part correct, cont. thus:—

Next row: Patt. 27, (w. fd., k. 2 tog., k. 1) 9 times, patt. 8 st. for front border.

Next row: Patt. 8, (w. fd., k. 2 tog., k. 1) 9 times, patt. 27. Rep. last 2 rows until work measures 3½in., ending at side edge. Change to No. 11 needles and cont. in patt. as now set, but inc. 1 st. at side edge on next row and every following sixth row until there are 74 st. Cont. straight (if necessary) until work measures 11½in., ending at shaped edge.

Shaping Sleeve

Inc. 1 st. at side edge on next 16 rows. Cast on 6 st. at beg. of next row, working the extra st. in double moss st. Cont. straight until work measures 14½in., ending at sleeve edge.

Shaping Collar

Next row: Patt. 61 (w. fd., k. 2 tog., k. 1) 8 times, patt. to last st., inc. 1 st.

* Work 11 rows as now set, but inc. 1 st. at collar edge on fourth and eighth of these rows *.

Next row: Patt. 61, (w. fd., k. 2 tog., k. 1) 7 times, patt. to last st., inc. 1 st.

Rep. from * to * once.

Next row: Patt. 61, (w. fd., k. 2 tog., k. 1) 6 times, patt. to last st., inc. 1 st.

Rep. from * to * once.

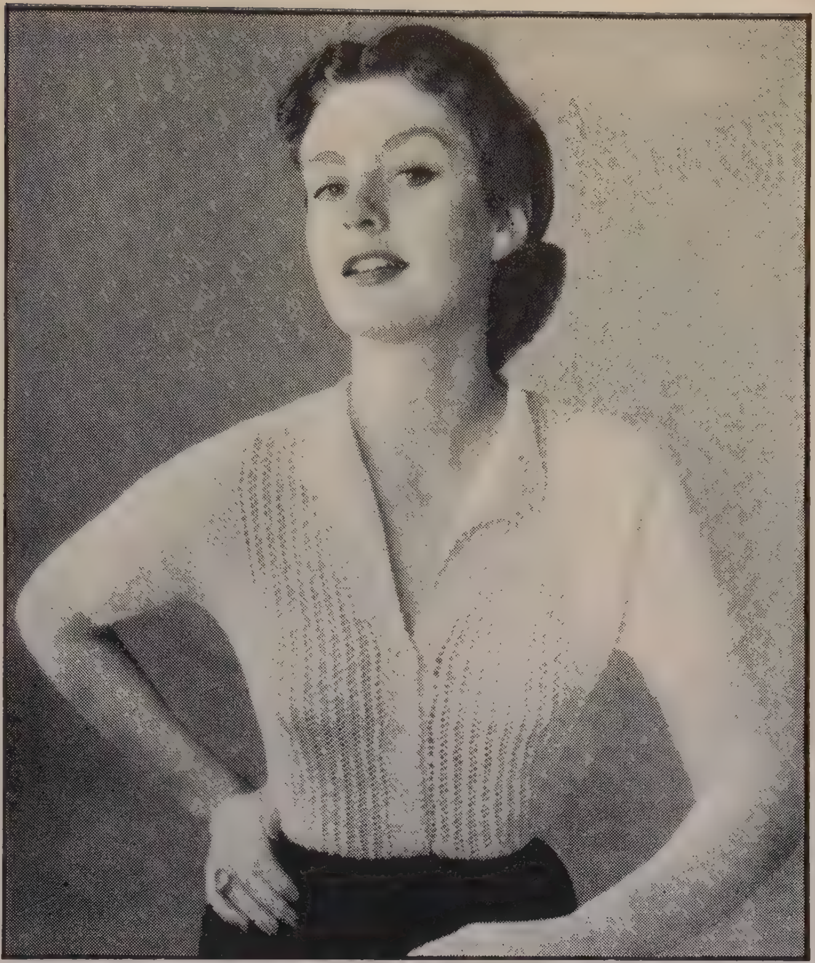
Next row: Patt. 61, (w. fd., k. 2 tog., k. 1) 5 times, patt. to last st., inc. 1 st.

Work 8 rows, but inc. 1 st. at collar edge on fourth and eighth rows. Work back to sleeve edge.

Shaping Shoulder

Cast off 7 st. at start of next 2 rows that begin at sleeve edge. Work 1 row straight.

Next row: Cast off 7 st., work to last 5 st., turn.



Next row: Work to end.

Rep. last 2 rows 3 times more (thus working 5 st. less at rever edge each time).

Next row: Cast off 11 st., work to last 5 st., turn.

Next row: Work to end. Rep. last 2 rows once.

Next row: Cast off 11 st., leave remaining st. on a spare needle for collar.

Right Front

With No. 13 needles cast on 62 st.

First and second rows: (P. 1, k. 1) to end.

Third and fourth rows: (K. 1, p. 1) to end.

Make a buttonhole in next 2 rows and begin open work front panel.

Next row: Patt. 3, cast off 2 st., leaving 1 st. on right-hand needle, patt. 2, (w. fd., k. 2 tog., k. 1) 9 times, patt. to end.

Next row: Patt. 27, (w. fd., k. 2 tog., k. 1) 9 times, patt. 3, cast on 2, patt. 3.

Cont. as given for left front, but make 6 more buttonholes at intervals of 2½in., thus the last buttonhole will be worked just ½in. below beginning of collar shapings.

Back

With No. 13 needles cast on 116 st. and cont. in double moss st. until work measures 3½in.

Change to No. 11 needles and cont. in double moss st., but inc. 1 st. at each end of next row and every following sixth row until there are 140 st.

Cont. straight until work measures 11½in.

Shaping Sleeve

Inc. 1 st. at each end of next 16 rows. Cast on 6 st. at start of next 2 rows. Cont. straight until back measures the same length as front up to beginning of sleeve top shaping.

Shaping Sleeve Top

Cast off 7 st. at start of next 12 rows.

Shaping Shoulders

Cast off 11 st. at start of next 6 rows. Leave remaining st. on a spare needle for back neck.

Collar

Join shoulder seams.

Slip all st. of left collar, back neck, and right collar section on one No. 11 needle and cont. thus:—

Next row: K. 1, w. fd., k. 2 (w. fd., k. 2 tog., k. 1) to last st., k. 1.

Next row: K. 1, (w. fd., k. 2 tog., k. 1) to last st., k. 1. Rep. last row 6 times more. Cast off.

Making up

Press lightly on wrong side, using a warm iron and a damp cloth. Join side and sleeve seams. Work the following picot edge all round front, collar, and sleeve edge:—

One single crochet into edge * 3 chain, 1 double crochet back into the first of these chain, miss a small space, 1 single crochet into edge. Rep. from * to end. Sew on buttons. Press edging and seams.

Jersey Suit for 2-year-old Boy

A TWO-YEAR-OLD boy will keep warm running in and out if he wears the neat little 3-ply jersey suit illustrated. Instructions for making the suit are given in this article. Materials required are: 5oz. of 3-ply lambs' wool or baby wool; 1 pair each of No. 10 and No. 12 knitting needles; elastic for waist of knickers.

MEASUREMENTS: Jersey, length from shoulder, 12½in.; width all round under the arms, 21in.; sleeve seam, 9½in. Knickers, length down side fold, 8½in.; width all round widest part, 23in.

Tension: 17 stitches to 2in. in width and 10 rows to 1in. in depth.

Abbreviations: K., knit; p., purl; st., stitch(es); rep., repeat; inc., increase; dec., decrease; patt., pattern; beg., beginning; w. fd., wool forward; tog., together.

Jersey

The Back

With No. 12 needles cast on 91 st. and work 2in. in k. 1, p. 1 rib. Change to No. 10 needles and work in patt. as follows:—

First row: K. 2, * p. 3, k. 3; rep. from * to last 5 st., p. 3, k. 2. Second row: P. 2, * k. 3, p. 3; rep. from * to last 5 st., k. 3, p. 2. Rep. these 2 rows once more. Fifth row: As second row. Sixth row: As first row. Rep. last 2 rows once more. These 8 rows form one patt. Continue in patt. until the work measures 8½in. from beg.

Armhole shaping: Cast off 4 st. at beg. of next 2 rows, then cast off 2 st. at beg. of next 4 rows. Continue without shaping until the work measures 12in. from beg. Cast off.

The Front

Work as given for the back until the armhole shaping has been completed, then continue without further shaping until the work measures 10in. from beg., ending with a wrong side row.

Neck shaping: Next row: Patt. 31, cast off 13, patt. to end. Continue on last set of st., but dec. 1 st. at neck edge on every row until 17 st. remain. Continue without further shaping until the work measures 13in. from beg. Cast off. Join wool to st. for other side and work up this to match the first.

The Sleeves

With No. 12 needles cast on 43 st. and work 2in. in k. 1, p. 1 rib. Change to No. 10 needles and work in patt., but inc. 1 st. at both ends of the fifth row and every following sixth row until there are 67 st. Continue without further shaping until the work measures 9½in. from beg., then shape top by dec. 1 st. at both ends of every row until 11 st. remain. Cast off.

The Neckband

Join the right shoulder seam, then with the right side of the work facing the knitter, and using No. 10 needles, pick up and k. every st. round the neck edge. Work in k. 1, p. 1 rib, but dec. 1 st. at both front corners on every alternate row until 1 st. remains in between the decreases. Work 1 row, then cast off loosely ribwise.

Knickers

The Left Leg

With No. 10 needles cast on 103 st. and work 1in. in k. 1, p. 1 rib. Change to the patt. and work a further 2½in., then continue in patt., but dec. 1 st. at both ends of next row and every following fourth row until 81 st. remain, ending with a wrong side row.

Now shape the back as follows:—

First row: Patt. to last 12 st., turn and work back. Third row: Patt. to last 20 st., turn and work back. Fifth row: Patt. to last 28 st., turn and work back.

Continue in this way, working 8 st. less before turning, until 11 st. remain unworked. Now work 1 row across all st., then work 6 rows in k. 1, p. 1 rib. Next row: Rib 4, * take 2 tog., w. fd., rib 6; rep. from * to last 5 st., take 2 tog., w. fd., rib 3. Work 4 more rows in rib, then cast off loosely ribwise.

The Right Leg

Work as given for the left leg, but working the top shaping at the opposite edge.

The Gusset

With No. 10 needles cast on 1 st. K. three times into this st., then work in patt., but inc. 1 st. at both ends of every alternate row until there are 23 st. Now dec. 1 st. at both ends of every alternate row until 3 st. remain. Take 3 tog. Fasten off.

Making up

Press the work on the wrong side with a warm iron and damp cloth. Join the left shoulder seam of the jersey, then sew in the sleeves. Sew up the side and sleeve seams. Sew the gusset to the straight edges of the legs above the ribbing. Join the back and front seams. Thread elastic through the holes at the waist.

Book Review

"More Me and Gus": F. S. Anthony and F. Jackson

DESPITE the steady expansion in New Zealand's store of literature few works of fiction deal with our farming life in light-hearted manner. Books of the "Me and Gus" series are helping to fill that gap, though there is room for many more of the same type.

Since the "Me and Gus" radio programmes were first broadcast by the National Broadcasting Service and since the publication of the book of the same name, which has now been printed four times, Gus Tomlins and Mark Hendrick have become probably the two best-known "cow cockies" in New Zealand. But they are far from being the most successful and because of that their escapades in squeezing a living from their back-block dairy farms in Taranaki provide good entertainment.

In "More Me and Gus" the authors offer a return helping of the laugh-making fare they served so well in their first book. The setting and characters, the free and easy style, and the slang expressions are all the same as before and with them the authors have created an unmistakable New Zealand atmosphere.

Nevile Lodge again heightens the humour with another 16 comical line drawings.

—*J.W.McA.*

A. H. and A. W. Reed, Wellington. 9s. 6d.

Shampoo for Small Floor Rugs

SMALL rugs may be cleaned successfully at home with a shampoo made from half a cup of neutral soap or soapflakes dissolved in a quart of boiling water and left to cool. The solution will form a jelly, a cup of which should be put into a bowl and beaten to a stiff froth with an egg beater, care being taken to see that no liquid is left. This lather is applied to a small area at a time with a soft brush and scrubbed in lightly with a circular motion. When the lather appears soiled it should be scraped off with a spatula and the last traces removed with a clean cloth which has been dipped in warm water and wrung fairly dry.

This process is repeated on a small area at a time over the surface of the rug, each new area being started within the margin of the cleaned area so that no pieces are missed. As soon as the rinse water or cloth becomes soiled it must be changed for fresh water or a clean cloth. The rug should not be used until it is dry, but it will dry quickly, because very little moisture is used. When dry it should be brushed thoroughly, and will then be ready for use again.

—*MAUD B. STRAIN,*
Field Officer in Rural Sociology,
Department of Agriculture,
Dunedin

Anti-shrink and Anti-moth Treatment for Wool Fabrics

By MAUD B. STRAIN, Field Officer in Rural Sociology, Department of Agriculture, Dunedin

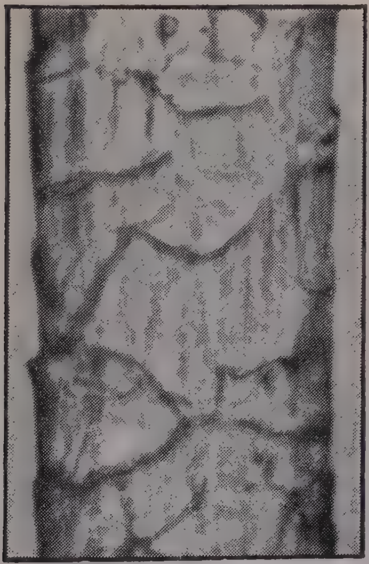
THE very large amount of wool lost to the world each year through shrinkage and moth damage at a time of high wool prices has been a challenge to textile research workers the world over. Britain, the United States, and Italy, in particular, have made great progress in research in recent years. A few of the results of their investigations are discussed in the following article.

NO matter how carefully woollens are treated there comes a time when it is necessary for them to be cleaned; for outer wear dry cleaning is indicated, but for underwear and socks washing is required. At this point the major problem of shrinkage is encountered. Though other fabrics may shrink in the first one or two washings, wool is liable to continue doing so if its particular laundering treatment is not understood.

A variety of wool fabrics.

Shrinkage and Felting

Shrinkage and felting in woollens arise from the fundamental construction of the wool fibre, which is round in cross-section, has a scaly surface structure, is elastic, and stretches and recovers its shape. These characteristics of wool are unique. Wool fabrics are elastic and consequently during the various processes of manufacture are liable to be stretched. This leads to trouble with washable fabrics unless precautions are taken to release the stretch before garments are made up from the material. Decrease in size owing to the release of this stretch is true shrinkage and usually occurs the first time the garment is washed. There is, however, another cause of decrease in the size of woollen articles which is known as felting and is due to the fibres from neighbouring threads becoming entangled with one another and drawing closer together. Felting is caused by friction or rubbing when the fabric is wet or only damp, as in wear, and is greatly helped by the presence of soap or alkali and heat. It is customary not to differentiate between these two processes when speaking of washable woollens and refer to them both as shrinkage.



[*International Wool Secretariat photo.*
Enlargement of a wool fibre, showing the scale structure, which has to be modified for production of a non-shrinking wool fabric.

Remedial Methods

In the laundry processes precautions can be taken such as using only lukewarm water and neutral soap with as little agitation as possible; however, at best these can only minimise shrinkage. To eliminate it methods have been evolved directed toward altering the structure of the individual fibres. A great amount of work has been done on the problem of shrinkage, approaching it from two angles. One method is directed toward modification of the scale structure of the wool and the other attempts to modify the elasticity of the individual fibres. The first tries either to round off the scale edges by chemical action as in chlorination or to mask the scales by depositing resin over them. This resin treatment has been done in the laboratory but has not been used commercially. The second method, dealing with elasticity, attempts to deposit resins actually within the wool molecule. It is being used commercially in the United States, but perfection has not yet been reached and research continues.

The greatest success commercially has been achieved by a process which rounds off the scale edges by use of chemicals. An earlier method, wet chlorination, in which the wool was immersed in a solution of hypochlorous acid, had to be carried through with speed, because too long immersion in the acid bath damaged the fibres. This method was somewhat uncertain in its results and has been superseded by dry chlorination, a process which uses chlorine gas. It is more easily controlled, is much slower, and consequently is more thorough. As the action is restricted to the surface of the fibres, there is less likelihood of damage and more certainty of unshrinkability. This is the method used in New Zealand woollen mills. In Australian mills a different reagent is used, a solution of caustic soda in methylated spirit instead of chlorine gas, with much the same results. In yet another method, said to remove the tickle from wool, a substance extracted from the tropical fruit pawpaw is used.

A striking illustration of the advantages of chlorination was seen recently. Three pieces, identical in size, of knitted woollen material, such as is used in the manufacture of women's underclothing, were under test. One was a control sample for final comparison; of the others one was given anti-shrink treatment and the other was untreated. These two were subjected to the equivalent of 35 launderings and then measured against the control. The anti-shrink sample was very little, if any, different in size and retained its former appearance and resiliency, whereas the untreated sample was much reduced in size, badly felted, and with none of its original ribbed appearance. As a result of this anti-shrink treatment garments which previously had to be discarded because of shrinkage long before they were worn out may now be used until they wear out. Socks, for example, can be worn for a much longer period than formerly, when they were frequently discarded not because they had worn out but because they had become too small. With nylon reinforcing now being used in the toes and heels, they should give much better service than before.

It must be understood that any fabric which has been stretched in the manufacturing processes will return to its unstretched size the first time it is wet. This is unavoidable unless special precautions have been taken in the final stages of manufacture to ensure that the fabric is kept free from any tension.

If shrink and non-shrink yarns are combined, various materials can be obtained such as those with crepe,

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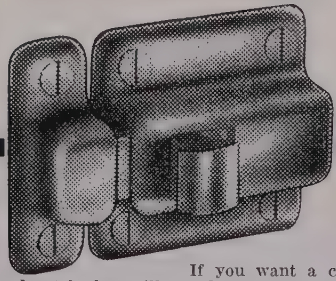

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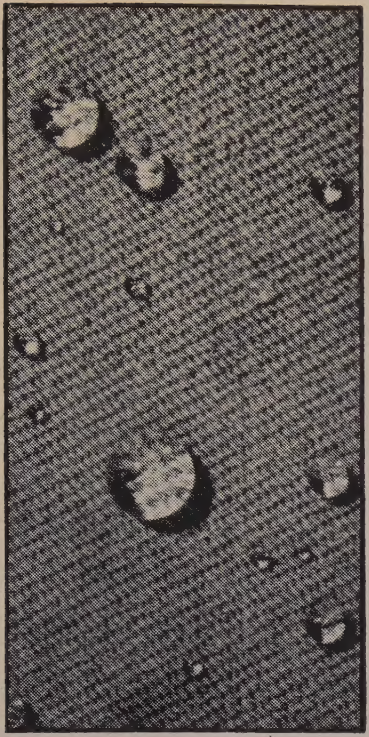


A waterproofed wool gabardine sprinkled with water drops, which do not penetrate the cloth.

blister, two-tone, and cross-dyed effects. Also non-shrink wool can be used as filling for washable quilts and cushions, or when printed it can be used for furnishing fabrics.

Dry Cleaning and Retexturing

Woollen outer clothes, suits, and overcoats which cannot be laundered are usually dry cleaned. In this process solvents are used to remove oily or greasy spots and stains. The wool fibres themselves contain a small amount of natural oil which gives an inherent resistance to soiling. This oil is removed by the solvents with the unwanted spots and stains. Modern dry-cleaning methods aim at removing the soiling and then restoring the natural oil to the fabric so that it will have lost nothing of its original condition in the process.

Protection against Pests

Moth Proofing

It is the moth grubs that damage woollen fabrics; the moth itself does not feed. The eggs hatch out in 4 to 10 days and the larvae, or grubs, feed on the wool till fully grown. They form a cocoon and remain in this until it is time for them to emerge as adult moths and start the cycle again. The larvae feed on any fibres containing keratin and casein, such as wool, fur, hair, and feathers, and other fibres when mixed with wool.

In Great Britain alone each year moths cause damage to the value of £1,000,000, and it is estimated that the annual over-all loss is about 2,500,000lb. of wool. This has led to intense research into methods of combating these pests, and several methods, temporary and permanent, can be used to protect woollens, but the permanent proofing must be done in the manufacture of the fabrics.

Temporary measures for preventing moth damage, more or less routine in most households, are: Exposure of material to sunlight after thorough brushing; storage in sealed containers with naphthalene, paradichlorobenzene, or D.D.T. powder; spraying with D.D.T. solution; washing and dry cleaning, which destroy moth life but give no protection against reinfestation; use of camphor-wood and cedar chests, which discourage moth attack if the lids of the containers are kept tightly shut.

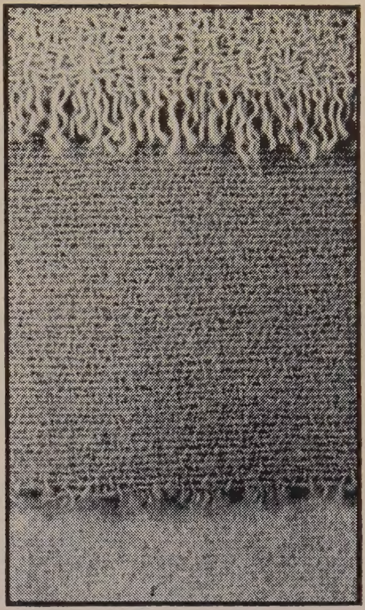
D.D.T. in an organic solvent can be used as a spray or liquid wash on floor boards, wardrobe shelves, and walls, and in crevices between boards, all of which are harbouring places.

Control of Carpet Beetle

Moths alone are not responsible for damage. The carpet beetle is yearly an increasing cause of trouble. As with moths, it is the larvae of the beetle (that is, when the insect is a small grub about ⅛in. long, similar to but smaller than the black hairy caterpillar) that damage woollen fabrics. The beetle breeds in obscure cracks in floors, drawers, and the deeper parts of upholstered furniture, where it is difficult to attack.

A simple, effective remedy which will kill the carpet beetle at all stages is to dip infested clothing or fabrics in hot water at a temperature of 140 degrees F.

D.D.T. is ineffective against the carpet beetle in all stages, except as the newly hatched larva. Deodorised "Gammexane" in one form or another, depending on whether it is needed to kill an infestation already established or as a preventive measure, or lindane has proved more effective than most other preparations.

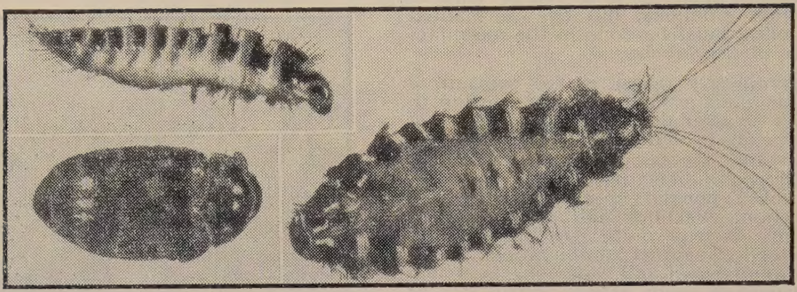


A range of wool fabrics from fine georgette (upper) to a flannel material.

A carpet attacked by carpet beetle grubs may be treated with a deodorised "Gammexane" or lindane spray containing pyrethrum. These sprays have a refined kerosene base and should not be used on fabrics which stain easily. They leave an almost imperceptible deposit which remains effective for some time and leaves no unpleasant odour.

A spray gun is used, but the atomiser type is not recommended. The spray is applied lightly to both sides of the carpet and particular attention is given to the edges of both sides. The insides of cupboards and wardrobes and cracks and crevices in the floor and skirting boards should be treated. Further treatment should be given at 3-monthly intervals until all

Wool specially processed to use for quilting.



Stages in the development of the carpet beetle. Top left—Larva or "buffalo bug". At this stage the insect damages fabrics. Bottom left—Adult beetle. Right—Beetle emerging from pupal skin.

grubs have been destroyed. After this, one spraying every 12 months should suffice.

Another method of destroying an infestation of grubs in a carpet is to steam all the infested parts, particularly round the edges, by ironing them with a hot iron over a damp cloth, as in pressing woollen clothes. The iron should be as hot as possible without scorching the carpet, and the cloth must be redamped frequently. The steam kills immediately all grubs at any stage of growth in the carpet. It will not kill any which are hiding in cracks or crevices.

Precautions with spray: The spray has a kerosene base and is therefore inflammable. It must not be stored or used near a naked flame. "Gammexane" and lindane are poisons and should not be allowed to come in contact with the skin or with foodstuffs or utensils, and should be stored out of reach of children.

Preventive measures: A deodorised "Gammexane" or lindane spray without pyrethrum may be used if preferred. It can be sprayed lightly over carpets, furs, curtains, blankets, or as expediency demands. The toxic effect, though lasting, is not permanent and spraying should be repeated at intervals.

An odourless "Gammexane" insect powder is suitable for use in drawers and storage spaces. It is harmless to fabrics and can be used for carpets, rugs, upholstered furniture, clothing, textiles, furs, and feathers. Only a light film of powder is necessary and will give protection over long periods to carefully wrapped and stored goods. To protect carpets and underfelt against attack they may both be dusted lightly with the powder above and below. Blankets and other woollen goods stored for the summer can be protected by a light dusting before being folded.

Other Treatments

Carpets and other floor coverings should be insect proofed with a solution of sodium fluosilicate, at a strength of 1oz. of powder to 1 gallon of water, applied to the backs of carpets to obtain as deep a penetration as possible.

All these methods afford some degree of temporary protection, but are by no means certain. A treatment aiming at establishing moth resistance in the fibre itself is being tried out and seems to be giving good results. The aim is to make the wool useless as a food for moth and beetle grubs. The wool is treated with a toxic chemical permanently fixed, as is a dye, and is applied with the dye in the finishing processes. One such compound, a Swiss product, is a colourless dye which forms a permanent union with the fibre and is applied during dyeing. It has no effect on the feel of the fabric, has no unpleasant odour, is not poisonous to humans, and is fast to sunlight, brushing, washing, and dry cleaning. The finish is durable and protects the wool for its normal life against moths and similar pests. Some carpets, rugs, and knitting wool proofed in this way are coming into the country.

Water-repellancy Treatment

Another treatment is applied to some woollen materials, especially overcoatings and materials for winter sports outfits, to make them shower-proof. Undoubtedly the weave influences this property to some extent; the tighter the weave and the more the twist given to the yarn the less readily will it take up moisture, but a water-repellant finish adds greatly to its efficacy. As a final stage in the manufacture of the cloth after the scouring has been completed the material is put through a waterproofing solution containing lead acetate and alum which forms a water-repellant deposit on the fibres. This method was largely used for waterproofing military overcoats. A more recent method uses an emulsion of paraffin wax with aluminium acetate. Suits are given a water-repellant finish, not to make an overcoat unnecessary but to ensure that no damage will be done to clothes should the wearer be caught by an unexpected shower. This type of water repellancy is destroyed by dry cleaning, but the material can be re-treated.

A water-repellant material is not waterproof. Waterproofing was originally achieved by the use of a film of rubber or oil, by which the weave was sealed and the fabric made impermeable to water and air; therefore, the fabric did not "breathe". Garments so proofed offered excellent protection against the weather, but were most uncomfortable if worn for long periods. The general belief now is that a thin, lightweight, very closely woven fabric which does allow ventilation used as an outer layer over thicker woollens will give the maximum protection from wind and rain.

Wear Resistance

A method of treating wool with rubber latex which deposits rubber in the fibres and improves wear resistance has been used successfully with dress fabrics and carpet pile. Blending of wool with other fibres such as cotton in the making of viyella, clydella, and union flannel is very well known. These fabrics can be washed repeatedly without shrinkage because they contain at least 25 per cent. of cotton, yet their warmth is barely lessened. Nylon is being used increasingly with wool, a blend which gives a strong, fine, warm cloth which is shrink resistant and drapes well.

Washing Method

With moth-proofing and shrink-resisting finishes the stage is set for easier care and longer life for woollens, although it is still necessary to take some precautions. Woollens should always be thoroughly cleaned before being stored. Proper laundering is most important, and they should always be washed at mild temperatures, not above body heat, and with a neutral soap or soapless detergent. Soap is made by the action of alkali, usually caustic soda, on fat. If there is an excess of caustic soda, it remains in the soap and is liberated when the soap is used in water. Caustic soda is injurious to delicate textile fibres such as wool, silk, and rayon. Neutral soap contains no free caustic soda. The garments should be gently squeezed and relaxed in the water, never rubbed or wrung. They must be rinsed thoroughly in water at the same temperature as the washing water and dried immediately. If they are put through a washing machine, the time in the washer should be less than half that given other clothes. The wringer should be slackened off. Woollens should be pulled gently into their original shape and never dried by the fire.

Book Review

"Pressure Cooking for the Modern Home" : Helen M. Cox

HELEN M. COX'S book on pressure cookery is a practical publication for the New Zealand housewife who is interested in making full use of her pressure cooker. Recipes are original, varied, and adapted to New Zealand conditions, and the chapters on soups, meats and poultry, fish dishes and savoury luncheon dishes, vegetables, fruits and desserts, porridge and dried cereals, jams and marmalade, and bottling contain general rules for the cooking of each type of foodstuff together with a good variety of recipes.

The writer does not make the mistake of advocating the use of the pressure cooker for foods or dishes better cooked in other ways or of minimising the times required for cooking foods adequately. Several innovations are described, and they should be particularly useful to the newcomer to pressure cookery, as they include time-saving ideas and methods not usually found in booklets provided with pressure cookers.

—*E.L.*

Whitcombe and Tombs Ltd. 5s. 6d.

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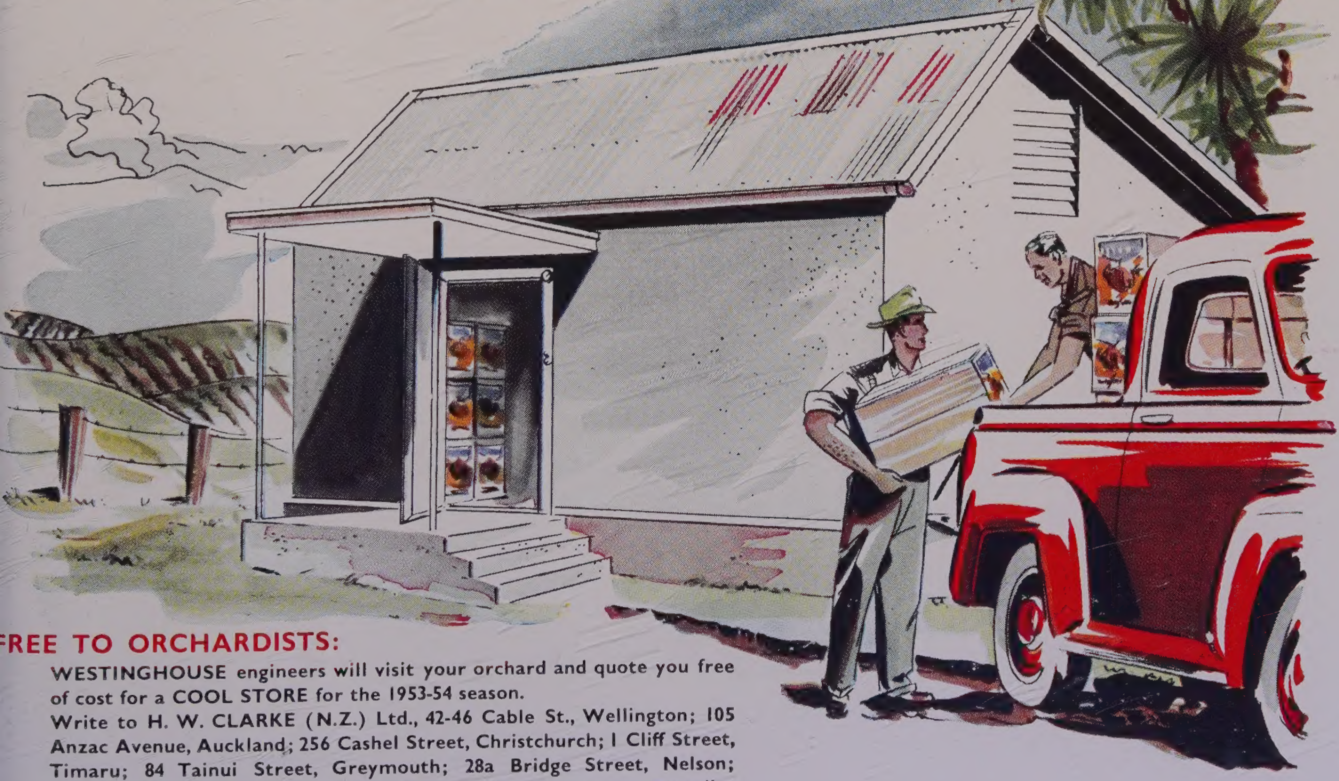

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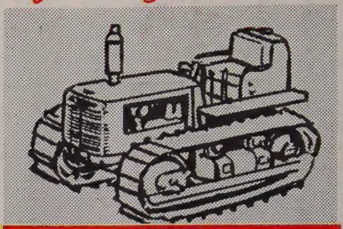

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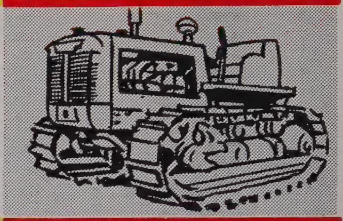

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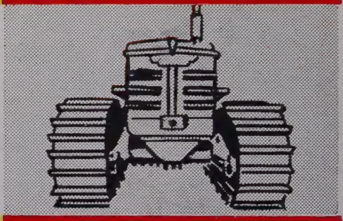

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